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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 20
OCTOBER 15, 1976

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 20
OCTOBER 15, 1976

W76-10501 -- W76-11100

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

STRUCTURE OF WATER IN THE CELL: REVIEW OF THE LITERATURE, (IN RUSSIAN),
Leningrad Inst. of Hematology and Blood Transfusion (USSR).
P. M. Medvedev, and T. I. Fisanovich.
Probl Gematol Pereliv Krovi 20(4), p 38-43. 1975.

Descriptors: *Reviews, *Water structure, *Cytological studies, Water properties, *Molecular structure, Polymers.
Identifiers: *Literature, Reviews, *Biopolymers.

The diversity of interactions of molecules of piopolymers with water, molecules of biopolymers with each other in the presence of water and of water molecules in the presence of biopolymers, is reviewed.--Copyright 1976, Biological Abstracts, Inc.
W76-10974

1B. Aqueous Solutions and Suspensions

WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. I. EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER,
Rouen Univ. (France). Lab. of Macromolecular Chemistry.
For primary bibliographic entry see Field 3A.
W76-10620

STRUCTURE OF WATER IN THE CELL: REVIEW OF THE LITERATURE, (IN RUSSIAN),
Leningrad Inst. of Hematology and Blood Transfusion (USSR).
For primary bibliographic entry see Field 1A.
W76-10974

2. WATER CYCLE

2A. General

LINEAR AND NONLINEAR APPROACHES FOR SHORT-TERM RUNOFF ESTIMATIONS IN TIME-INVARIANT OPEN HYDROLOGIC SYSTEMS,
Thessaloniki Univ., Salonika (Greece). Hydraulics and Land Reclamation Lab.
For primary bibliographic entry see Field 2E.
W76-10699

THE INFLUENCE OF SLOPE AND RAIN INTENSITY ON RUNOFF AND INFILTRATION.
SLETCO, Beirut (Lebanon).
S. H. Nassif, and E. M. Wilson.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 539-553, December 1975. 11 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Infiltration, *Rainfall simulators, *Slopes, *Rainfall intensity, *Runoff, Laboratory tests, Instrumentation, Soils, Drops(Fluids), Raindrops, Drains, Watersheds(Basins).
Identifiers: *Soil catchment area, Drop size distribution.

The design and construction of a special-purpose laboratory catchment and rainfall simulator was described. The equipment consisted of a soil catchment area that could be inclined at various angles. Additional instrumentation then measured athe flow of water across the surface of, and through, the soil bed. Precipitation was provided by a unit that simulated rainfall at particular rates with uniform distribution. The equipment was used to examine infiltration, runoff and other hydrological properties of a number of soils under different rainfall intensities and with different catchment slopes. Correlations were obtained for these variables. Some experiments were carried out with differing initial soil conditions classified as dry damp, medium wet, wet, and very wet. The various effects of increasing initial wetness confirmed what was already known that runoff started earlier and was obtained earlier. (Roberts - ISWS)
W76-10702

SELECTION OF TYPICAL SMALL DRAINAGE BASINS FOR INVESTIGATING AND COMPUTING SPRING RUNOFF FROM LARGE RIVER BASINS,
For primary bibliographic entry see Field 4A.
W76-10705

INVESTIGATION OF THE HYDROLOGIC CHARACTERISTICS OF TALUS,
For primary bibliographic entry see Field 2F.
W76-10706

FLOW RESISTANCE IN BROAD SHALLOW GRASSED CHANNELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2E.
W76-10710

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-10813

AN ANALOG MODEL OF THE CHIPUXET AQUIFER, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W76-10814

DEVELOPMENT OF A WATER QUAITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W76-10815

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

ENTROPY PRINCIPLE APPLIED TO THE RAINFALL-RUNOFF PROCESS,
Lagos Univ. (Nigeria).
J. O. Sonuga.
Journal of Hydrology, Vol. 30, No. 1/2, p 81-94, May 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Entropy, *Rainfall-runoff relationships, *Hydrology, *Model studies, Rainfall, Runoff, Probability, Graphical analysis, Watersheds(Basins).
Identifiers: *Conditional entropy, *Variates, Graphs, Covariance.

An application of the entropy principle to the rainfall-runoff process was described. The expression for conditional entropy was maximized subject to certain constraints to obtain the conditional distribution of a variate y, representing runoff, given the occurrence of a variate x, representing rainfall. The distribution that resulted from the maximizing procedure was the 'minimally prejudiced assignment of probabilities on the basis of the given information'. The parameters of the distribution were based on prior information about the estimated means and covariance of the rainfall and the runoff series. The distribution was presented in a tabular form making it possible to prepare useful tables and graphs for ease of application. Although the expression for the distribution appears cumbersome, the charts could be prepared by computer. The preparation of the tables is of particular value to the hydrologist/engineer in remote environments where improved processing facilities such as electronic computers are not readily available. (Roberts - ISWS)
W76-10918

APPLICATION OF THE STANFORD WATERSHED MODEL TO NIGERIAN WATERSHEDS,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
N. Egbuniwe, and D. K. Todd.
Water Resources Bulletin, Vol. 12, No. 3, p 449-460, June 1976. 5 fig, 2 tab, 11 ref.

Descriptors: *Watershed management, *Model studies, *Streams, *Africa, Digital computers, Watersheds(Basins), Water management(Applied), Computer programs, Simulation analysis, Water resources development, Hydrologic data.
Identifiers: *Stanford Watershed Model, *Nigeria(Kontagora watershed), Gaged streams, Model parameters, Ungaged streams, *Nigeria(Malendo watershed).

The Nigerian version of the Stanford Watershed Model was tested on two Nigerian watersheds - the Malendo and the Kontagora. The annual water yield estimates seemed to be good, but monthly and daily estimates showed some discrepancies caused by the convective nature of the storms and the large sizes of the watersheds being considered. The Malendo watershed was treated as ungaged, and model parameters were extrapolated from the adjacent Kontagora watershed; the results were encouraging. Considerable familiarity with the model was achieved so that further work with it in Nigeria would be possible. The model appeared to simulate the hydrologic processes (streamflow, soil moisture, and evapotranspiration) with the accuracy of the basic input data. Application of the model for drought study appears possible. (Roberts - ISWS)
W76-10923

A NOTE ON THE CONTRIBUTION OF FOG DRIP TO STREAMFLOW,
Southampton Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-10927

SOIL WATER MODELING I: A GENERALIZED SIMULATOR OF STEADY, TWO-DIMENSIONAL FLOW,
Agricultural Research Service, Columbia, Mo. North Central Region Watershed Research Center.
For primary bibliographic entry see Field 2G.
W76-10933

APPLICATION OF A RESIDENCE TIME MODEL TO DILUTION GAUGING, WITH PARTICULAR REFERENCE TO THE PROBLEM OF CHANGING DISCHARGE,
Institute of Hydrology, Wallingford (England).

For primary bibliographic entry see Field 2E.
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LOESS DISTRIBUTION BY VARIABLE WINDS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 2J.
W76-10941

ROLE OF PRECIPITATION IN THE CHEMISTRY OF SUBSURFACE WATERS IN THE WESTERN PART OF THE TURGAY TROUGH,
For primary bibliographic entry see Field 2F.
W76-10942

A DISCRETE LINEAR CASCADE MODEL FOR HYDROLOGY,
University Coll., Galway (Ireland).
For primary bibliographic entry see Field 2E.
W76-10946

A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION: THE EFFECTS OF ALTERING DEPTH AND RIVER DISCHARGE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 2L.
W76-10948

2B. Precipitation

USE OF LOG-NORMAL DISTRIBUTIONS FOR NUMERICAL CALCULATIONS OF CONDENSATION AND COLLECTION,
Atmospheric Environment Service, Downsview (Ontario).
T. L. Clark.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 810-821, May 1976. 10 fig, 1 tab, 10 ref.

Descriptors: *Model studies, *Condensation, *Coalescence, Mathematical models, Numerical analysis, Mathematical studies, Cloud physics, Clouds, Precipitation(Atmospheric), Meteorology.
Identifiers: Finite-difference models, Lagrangian parcel calculations.

Lagrangian parcel calculations of condensation and coalescence theory were presented where both a distribution function approach as well as a conventional finite-difference approach were compared. The comparisons suggested that the use of series of log-normal distributions to represent the water droplet spectra may be a practical approach to treating cloud physical processes in multi-dimensional cloud models. (Sims - ISWS)
W76-10694

SUPERSATURATION AND TIME DEPENDENCE OF ICE NUCLEATION FROM THE VAPOR ON SINGLE CRYSTAL SUBSTRATES,
Nevada Univ., Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W76-10695

IDENTIFICATION OF NUCLEI AND CONCENTRATIONS OF CHEMICAL SPECIES IN SNOW CRYSTALS SAMPLED AT THE SOUTH POLE,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-10696

THE GROWTH RATES AND DENSITIES OF ICE CRYSTALS BETWEEN -3C AND -21C,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia), Div. of Cloud Physics.
B. F. Ryan, E. R. Wishart, and D. E. Shaw.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 842-850, May 1976. 13 fig, 2 tab, 18 ref, 1 append.

Descriptors: *Crystals, *Growth rates, *Ice, Laboratory tests, Microscopy, Density, Snow, Clouds, Cloud physics, Time, Temperature, Supersaturation, Meteorology.
Identifiers: *Ice crystal growth.

Ice crystals were grown in a supercooled cloud at temperatures ranging from -3C to -21C for periods from 30-40 s to 150-180 s. When the axial dimensions at a given time were examined as a function of temperature, there was a marked maximum along the a axis at -15C and a secondary broader maximum along the c axis at -6C. The growth of the axial dimensions can be adequately represented by a linear function of time. A power function of time was fitted to the crystal mass growth measurements; these show a sharp maximum at -15C and a secondary broader maximum at -7C. Crystal bulk densities estimated from the masses and axial dimensions vary with temperature in a complicated way, with a minimum of about 0.4 Mg/cu m at -5 and -17C, and a maximum of 0.92 Mg/cu m (pure ice) at -3C, and appear to be independent of time. (Sims-ISWS)
W76-10697

THE INFLUENCE OF SLOPE AND RAIN INTENSITY ON RUNOFF AND INFILTRATION.
SLETCO, Beirut (Lebanon).
For primary bibliographic entry see Field 2A.
W76-10702

A NORMAL MODE METHOD FOR PREDICTING STORM SURGES ON A LAKE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W76-10715

HETEROGENEOUS ICE NUCLEATION IN THE PRESENCE OF ALIPHATIC AMINES AND AMMONIA,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W76-10716

METEOROLOGICAL ASPECTS OF THE OAHU FLOOD OF 19 APRIL 1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
T. A. Schroeder.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 719, $4.50 in paper copy, $3.00 in microfiche. OWRT A-062-HI(1) 14-34-0001-6012. Technical Report No. 97, February 1976. 62p, 35 fig, 7 tab, 24 ref, append.

Descriptors: *Flash floods, *Rainfall, *Rain gages, *Synoptic analysis, *Hawaii, *Flood forecasting, Meteorology, *Meteoro logical data, Rainfall intensity, Model studies, Network, *Thunderstorms.
Identifiers: *Conceptual models(Meteorology), Mesoscale analysis, Mesoscale structure, *Oahu(HI).

A detailed study has been made of the severe Oahu rainstorm of 19 April 1974 and its implications for the Hawaii flood forecast problem. Conventional meteorological analyses were performed, using standard surface observations, aircraft reports, and satellite photography. Data from Oahu's extensive recording rain gage network were analyzed to determine the mesoscale structure of precipitating cloud systems. Conceptual models of the flood-producing convective elements were then constructed. It was found that the synoptic scale situation was one which has historically generated flooding. Fresh trade winds in the lower troposphere were combined with a trough in the upper troposphere to produce thunderstorms over Oahu. Hourly rainfall analysis revealed two centers of high rainfall. One of these centers was produced by a continuous thunderstorm. A conceptual model of a continuous thunderstorm over Oahu was then formulated. Study of the special rain and stream gage network in Moanalua Valley showed that the current monitoring scheme of one telemetered rain gage per valley is inadequate. Finally, the current state-of-the-art in Hawaiian flood forecasting and monitoring is discussed. It is proposed that the installation of a meteorological radar is the only viable solution to the problem of early detection of flash flood potential.
W76-10807

WSSI FINAL REPORT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
For primary bibliographic entry see Field 3B.
W76-10818

SOUTH DAKOTA WEATHER MODIFICATION PROGRAM, RESEARCH COOPERATIVE STUDIES UNDER PROJECT SKYWATER,
South Dakota Dept. of Natural Resources Development, Pierre. Div. of Weather Modification.
For primary bibliographic entry see Field 3B.
W76-10819

PROCEEDINGS FROM A WORKSHOP ON INADVERTENT WEATHER MODIFICATION.
For primary bibliographic entry see Field 3B.
W76-10901

ATMOSPHERIC EFFECTS OF POLLUTANTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10903

URBAN-INDUSTRIAL EFFECTS ON CLOUDS AND PRECIPITATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4C.
W76-10905

SOME CHARACTERISTICS OF A DUSTY RAIN IN YUGOSLAVIA,
Yugoslavic Academy of Science and Arts, Zagreb. Inst. for Physics of the Atmosphere.
For primary bibliographic entry see Field 5A.
W76-10906

WIND-TUNNEL SIMULATION OF ATMOSPHERIC FLOW AND DISPERSION,
Colorado State Univ., Fort Collins. Fluid Mechanics Program.
For primary bibliographic entry see Field 5A.
W76-10908

INADVERTENT EFFECTS IN WEATHER MODIFICATION,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 3B.
W76-10909

INTRODUCTION TO THE ATMOSPHERIC AEROSOL SYSTEM,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 5A.
W76-10911

ENTROPY PRINCIPLE APPLIED TO THE RAINFALL-RUNOFF PROCESS,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 2A.
W76-10918

A NOTE ON THE CONTRIBUTION OF FOG DRIP TO STREAMFLOW,
Southampton Univ. (England). Dept. of Geography.
A. M. Gurnell.
Weather, Vol. 31, No. 4, p 121-126, April 1976. 3 fig, 3 tab, 3 ref.

Descriptors: *Fog, *Streamflow, *Drainage, Mist, Rain gages, Precipitation(Atmospheric), Vegetation, Marshes, Soil moisture, Water supply, Grasses, Weather, Hydrographs, Watersheds(Basins).
Identifiers: *Fog drip, *Horizontal interception, *Arboreal interception, New Forest(Hampshire), Heathland, Woodland.

Fog drip from grasses and heather, in addition to direct fog precipitation on to the water surface, causes fluctuations in streamflow. Interception of precipitation by vegetation is usually considered to constitute a water loss. Little attention has been given to horizontal interception and fog drip. Consideration of this topic has been confined to arboreal interception rather than to that by shorter vegetation. Three references were quoted to indicate that work on fog drip has emanated from a few areas of the world where fog has provided the dominant form of precipitation. This paper considered the impact of fog drip on streamflow during one week in February 1975 in a small catchment in the New Forest, Hampshire, part of England, where fog is rare. Although the predominant vegetation within the watershed is heathland and a few patches of mixed woodland, streamflow peaks were recognized as a catchment response to fog precipitation via translatory flow from marshy areas after an approximate lag of 6 hours. (Roberts-ISWS)
W76-10927

SOME OBSERVATIONS ON THE JOSS-WALDVOGEL RAINFALL DISDROMETER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
P. I. A. Kinnell.
Journal of Applied Meteorology, Vol. 15, No. 5, p 499-502, May 1976. 3 fig, 9 ref.

Descriptors: *Raindrops, *Instrumentation, *Rainfall, Size, Particle size, Measurement, Rain gages, Velocity, Drops(Fluids), Laboratory tests, Equipment, Meteorology.
Identifiers: *Raindrop size, Disdrometers.

Laboratory experiments showed that the response of the Joss-Waldvogel rainfall disdrometer, a device designed to measure raindrop size from drop impact, was influenced not only by the size and vertical velocity of the drop but also by the shape of the drop. The results also suggested that a discontinuity exists in the response of the transducer between drops travelling at terminal velocity and drop travelling at an appreciably lower velocity. This discontinuity appears to be associated with the time taken for the drop to collapse. (Sims-ISWS)
W76-10928

POSSIBLE URBAN EFFECTS ON MAXIMUM DAILY RAINFALL AT PARIS, ST. LOUIS AND CHICAGO,
Meteorologie Nationale, Paris (France).
For primary bibliographic entry see Field 4C.
W76-10929

NUMERICAL SIMULATION OF JAPAN SEA EFFECT SNOWFALL,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2C.
W76-10930

MONSOONAL DEPOSITION OF SEA SALT AND AIR POLLUTANTS OVER BOMBAY,
Bhabha Atomic Research Centre, Trombay, Bombay (India). Air Monitoring Section.
For primary bibliographic entry see Field 5B.
W76-10932

HYDROLOGIC EFFECTS OF STORMS OF JUNE 24-28, 1974 IN LEE AND COLLIER COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-11077

2C. Snow, Ice, and Frost

SUPERSATURATION AND TIME DEPENDENCE OF ICE NUCLEATION FROM THE VAPOR ON SINGLE CRYSTAL SUBSTRATES,
Nevada Univ., Reno. Lab. of Atmospheric Physics.
For primary bibliographic entry see Field 3B.
W76-10695

IDENTIFICATION OF NUCLEI AND CONCENTRATIONS OF CHEMICAL SPECIES IN SNOW CRYSTALS SAMPLED AT THE SOUTH POLE,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
M. Kumai.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 833-841, May 1976. 11 fig, 4 tab, 16 ref.

Descriptors: *Snow, *Antarctic, *Chemistry, Crystals, Ice, Snow cover, Nucleation, Sodium chloride, Salts, Clays, Clay minerals, Laboratory tests, Electron microscopy, Cloud physics, Precipitation(Atmospheric), Meteorology.
Identifiers: *Snow crystals, Snow nuclei, Nuclei.

A total of 380 electron micrographs and electron diffraction patterns of 93 snow crystal nuclei were analyzed. The nuclei were identified as mainly clay minerals and sodium chloride particles. The clay mineral nuclei were illite 20%, kaoline 8%, halloysite 4%, vermiculite 3%, and related minerals 24%. For the other nuclei, sodium chloride accounted for 20%, and unidentified nuclei accounted for 5%. Fifteen percent of the snow crystals did not appear to have nuclei. Therefore, all nuclei found in snow crystals were terrestrial substances from oceans and continents. The mass of nuclei was from 0.0001 to 1 picogram for both clay minerals and sodium chloride. The shapes of snow crystals were single bullets, combinations of bullets, and hexagonal hollow columns. The snow crystals formed at temperatures from -30 to -35C. The snow crystal diameters were from 0.1 to 1.0 mm, and the crystal mass was from 0.01 to 10 micrograms. The mean mass concentration of sodium chloride in snow crystals was 40.6 ppb and that of clay minerals was 15.4 ppb. The sodium chloride nucleus concentration coincided within the experimental error with data taken from the chemical analysis of the South Pole snow cover made by several workers. It was concluded that most of the sodium chloride contained in the South Pole snow cover was due to the sodium chloride nuclei of snow crystals. (Sims-ISWS)
W76-10696

THE GROWTH RATES AND DENSITIES OF ICE CRYSTALS BETWEEN -3C AND -21C,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia), Div. of Cloud Physics.
For primary bibliographic entry see Field 2B.
W76-10697

TRANSPORT OF WATER AND HEAT IN A FROZEN PERMEAMETER,
Cornell Univ., Ithaca, N. Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-10713

A LABORATORY INVESTIGATION OF THE MECHANICS AND HYDRAULICS OF RIVER ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J. C. Tatinclaux, C. L. Lee, T. P. Wang, T. Nakato, and J. F. Kennedy.
IIHR Report No. 186, March 1976. 97 p, 22 fig, 1 tab, 7 ref, 4 append. Army DAAK03- 75-C-0030, NSF ENG-72-04118A02.

Descriptors: *Ice jams, *Rivers, *Hydraulic models, *Model studies, Ice flow, Floating, Streamflow, Froude number, Compressive strength, Ice cover, Laboratory tests, Mechanical properties, Hydraulics.
Identifiers: *Ice floes.

Experimental results are presented on the conditions of initiation of an ice jam by a simple surface obstruction, on the equilibrium thickness of an ice jam formed by accumulation and submergence of ice floes, and on the compression strength of floating, fragmented ice cover. In the study on ice jam initiation, it was found that the minimum concentration of floes in the opening of the obstruction at which a jam occurs is nearly independent of the ratio of width of constricted passage to channel width, and is proportional to a negative power of the ratio of floe length to width of constricted passage. From energy analysis of floe submergence, a relationship relating the thickness of a jam formed by accumulation and submergence of floes to the approach flow characteristics was derived and found to fit satisfactorily the experimental data. In both studies on jam initiation and development, it was found that surface tension, and therefore the wetting properties of the material used for small laboratory floes, has a significant effect on the submergence velocity of small floes, and should be taken into consideration when small scale laboratory investigations of ice jam phenomena are to be conducted using floes made of artificial material. Experiments on compression strength of floating, fragmented ice cover were conducted for ranges of cover length and cover thickness, using three different floe shapes and sizes. It was found that the compressive strength is inversely proportional to compression velocity and independent of cover length. (Sims - ISWS)
W76-10714

HETEROGENEOUS ICE NUCLEATION IN THE PRESENCE OF ALIPHATIC AMINES AND AMMONIA,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W76-10716

NUMERICAL SIMULATION OF JAPAN SEA EFFECT SNOWFALL,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
M. A. Estoque, and K. Ninomiya.
Tellus, Vol. 28, No. 3, p 243-253, 1976. 18 fig, 1 tab, 7 ref. NAS GA32202A

Descriptors: *Model studies, *Snowfall, *Orography, Mathematical models, Precipitation(Atmospheric), Monsoons, Winter, Mountains, Temperature, Air temperature, Winds, Humidity, Distribution, Simulation analysis, Bodies of water, Climatology, Meteorology.
Identifiers: *Japan Sea, Japan.

Snowfall associated with the modification of cold air-mass outbreaks by the Sea of Japan was simulated with a simple numerical model. The model incorporates the effects of momentum, heat, and moisture fluxes across the air-sea interface as well as the effects of orography. The simulated distributions of snowfall, temperature, wind, and moisture were compared with observations and reasonable agreement was found. Numerical experiments were made in order to determine the dependence of the snowfall distribution on the large scale prevailing conditions. The results indicated that the occurrence of snowfall is controlled primarily by orographic lifting. An unexpected finding was that the snowfall distribution is not very sensitive to the dryness of the prevailing flow. (Sims-ISWS)
W76-10930

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-10940

MILANKOVITCH SOLAR RADIATION VARIATIONS AND ICE AGE ICE SHEET SIZES,
Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering; and Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
J. Weertman.
Nature, Vol. 261, No. 5555, p 17-20, May 6, 1976. 6 fig, 7 ref.

Descriptors: *Model studies, *Ice, *Solar radiation, *Arctic, Mathematical models, Ablation, Snowfall, Radiation, Cold regions, Glaciers, Climatology, Ice cover.
Identifiers: *Ice sheets, *Ice age, Ice accumulation, Milankovitch solar radiation variations.

The fluctuations in the size of ice age ice sheets were calculated using glacier mechanics and the Milankovitch solar radiation variations. The calculations were greatly simplified by considering only two-dimensional ice sheets with profiles that would be appropriate if ice obeyed the flow law of a perfectly plastic solid. The solar radiation variations seem to be large enough to account for ice ages. (Sims - ISWS)
W76-10949

METHOD OF MAKING SNOW,
For primary bibliographic entry see Field 3B.
W76-10958

BOG STRATIGRAPHY, RADIOCARBON DATES, AND PINEDALE TO HOLOCENE GLACIAL HISTORY IN THE FRONT RANGE, COLORADO,
Geological Survey, Denver, Colo.
R. F. Madole.
Journal of Research of the U S Geological Survey, Vol 4, No 2, p 163-169, March-April 1976. 4 fig, 1 tab, 9 ref.

Descriptors: *Glaciology, *Radioactive dating, *Geologic time, *Geologic formations, *Colorado, Revegetation, Bogs, Glaciohydrology, Ponds, Lakes.
Identifiers: *Front Range area(Colo).

Radiocarbon dates and stratigraphic cores from bogs, kettle ponds, and former ice-marginal lakes on the east and west sides of the Front Range, Colo., suggest that (1) valley glaciers of Pinedale age began to recede from their terminal positions between about 14,600 and 13,000 yr ago, (2) revegetation of glaciated areas at altitudes of 2,600-2,900 m (8,600-9,500 ft) was complete by 11,000-10,000 yr ago, (3) at one site, 3,500+1,000 yr elapsed before peat began to form after deglaciation, (4) the formation of bogs within the glaciated areas kept pace with glacier recession in a general way, beginning at progressively later times as deglaciation proceeded upward, (5) Pinedale glaciers had disappeared or were reduced to small remnants by about 8,000 yr ago, (6) moraines that have been mapped as belonging to the early stade of Pinedale Glaciation are no younger than 13,000 yr B.P. and may be older than 14,600 yr, and those de-limiting what has been mapped as late stade are no younger than about 7,600 yr B.P. and are probably older than 7,800 yr, and (7) most of the till mapped as Pinedale was deposited between about 14,600 and 8,000 yr ago. (Woodard-USGS)
W76-11071

OIL IN SEA ICE,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 5B.
W76-11098

2D. Evaporation and Transpiration

STUDIES ON EVAPOTRANSPIRATION OF SOME AQUATIC WEEDS,
United Nations Development Program, Kota (India). Chambal Land and Water Use and Management Project.
O. Brezny, I. Mehta, and R. K. Sharma.
Weed Sci. 21(3), p 197-204, 1973.

Descriptors: *Evapotranspiration, *Aquatic weeds, Water loss, Winds, Temperature.
Identifiers: Cyperus-rotundus, Eichhornia-crassipes, Ipomoea-aquatica, Pistia-stratiotes, Trapa-natans-var-bispinosa, Typha-angustifolia.

The evapotranspiration of 6 dominant emersed and floating weeds was studied. Evapotranspiration of water-chestnut (Trapa natans L. var. bispinosa Roxb.), waterlettuce (Pistia stratiotes L.), and swamp morninglory (Ipomea aquatica Forsk.) did not increase water losses significantly. Evapotranspiration of water hyacinth (Eichhornia crassipes (Mart) Solms.) was 30-40% higher, that of narrowleaf cattail (Typha angustifolia L.) was 60-70% higher, and that of purple nutsedge (Cyperus rotundus L.) was 130-150% higher than evaporation from a free water surface under equivalent conditions. Positive correlations (significant at the 1% level) were found between some meterological factors (daily maximum air temperature and daily average wind velocity), evaporation from free water surface, and evapotranspiration from aquatic plants studied.--Copyright 1973, Biological Abstracts, Inc.
W76-10554

THE EVAPORATION AND SEDIMENTATION IN MAN-MADE ARADE LAKE, SOUTHERN PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
G. K. Brouwer, and H. Ryckborst.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 555-574, December 1975. 10 fig, 6 tab, 6 ref.

Descriptors: *Evaporation, *Sedimentation, *Lakes, Rainfall, Intermittent streams, Flash floods, Subtropic, Citrus fruits, Leakage, Storage capacity, Dams, Rivers, Erosion, Artificial lakes, Lake sediments.
Identifiers: *Portugal(Arade Lake), The Algarve, *Man-made lakes, Arade Dam, *Mediterranean, Syphon.

Only four lakes exist in the dry subtropical part of southern Portugal. They are all man-made to satisfy the irrigation requirements of the citrus producers. The evaporation rate of one of the lakes, Arade Lake (91.9 sq km) averaged 4.1 mm/d (1500 mm/year) during 1970, compared with a rainfall of 680 mm. The sediment accumulation in the lake since the construction of the Arade Dam amounted to 300,000 cu m over the period 1965-1973 or 200,000 tons per year. This was equivalent to a decrease of 10% in the original lake storage capacity. By the year 2030, about one half of the lake would be filled by sediments. The risks associated with the storage of flash floods would then increase to unacceptable levels. The Portuguese Government is now considering a new and higher dam 4 km upstream from the present Arade Dam. (Roberts - ISWS)
W76-10703

PREDICTING CONSUMPTIVE USE WITH CLIMATOLOGICAL DATA,
New Mexico State Univ., University Park. Dept. of Agronomy.
E. J. Gregory, and E. G. Hanson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 791, $4.00 in paper copy, $3.00 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 066, April 1976, 43 p, 2 fig., 31 tab., 9 ref., append. OWRT A-043-N Mex(1).

Descriptors: *Consumptive use, *Evaporation, *Evapotranspiration, *Lysimeters, Crop production, Crop response, Irrigation effects, Irrigation efficiency, Irrigation programs, Moisture content, Soil moisture, Soil water, Climatic data, Efficiencies, New Mexico, Cotton, *Forecasting, *Climatic data, Alfalfa, Corn(Field), Barley, Potatoes, Onions, Lettuce.
Identifiers: *Neutron probe, *Blaney-Criddle Method, Jensen method, Irrigation scheduling, Elephant Butte Irrigation District(NM), Dona Ana County(NM), San Juan County(NM), Sweet corn.

Consumptive-use coefficients currently used for determining irrigation requirements and water rights in New Mexico have been imported from other states for most crops because of the lack of measurements made in the state. Consumptive-use measurements for selected crops were made and consumptive-use data from earlier irrigation research projects in which soil moisture depletion measurements had been made were evaluated. Computed consumptive-use coefficients and ratios of measured consumptive use to measured pan evaporation are presented with climatological data and moisture depletion measurements for various crops, including alfalfa, sweet corn, cotton, onions, potatoes, lettuce and spring barley. Data are tabulated to separate the frost-free seasonal coefficients from the coefficients in the frost season. The seasonal consumptive-use coefficients are computed, tabulated and summarized for seasonal measurements. These coefficients are compared with coefficients in current use in New Mexico. The monthly coefficients are highly variable as compared to the seasonal coefficients. Ratios of consumptive use to evaporation are tabulated and summaries of seasonal ratios are presented. The variability of these data appear to be similar to the variability among consumptive-use coefficients. The practical use of the monthly consumptive-use coefficients data for the Blaney-Criddle formula is limited due to the excessive variability. The seasonal values are more stable but measurements should be continued for several more years to evaluate their reliability. The high variability is caused in part by not including weather factors other than temperature and length of daylight hours.
W76-10873

THE INADVERTENT IMPACTS OF AGRICULTURE ON WEATHER AND CLIMATE AND

AGRICULTURAL METHODS FOR AMELIORATION OF CLIMATIC STRESS,
Nebraska Univ., Lincoln. Dept. of Agricultural Climatology.
For primary bibliographic entry see Field 3B.
W76-10902

2E. Streamflow and Runoff

THE RELATIONSHIP OF SLOPE AND STREAM CHANNEL FORM IN THE RIVER DART, DEVON,
Exeter Univ. (England), Dept. of Geography.
C. C. Park.
Journal of Hydrology, Vol. 29, No. 1/2, p 139-147, March 1976. 3 fig, 1 tab, 26 ref.

Descriptors: *Channel morphology, Hydraulic properties, *Open channel flow, Regression analysis, Hydraulics, Streamflow, Channels, On-site investigations, Slopes.
Identifiers: *Stream geometry, *Channel geometry, Channel capacity, *River Dart(England), *Channel slope, Channel network, Hydraulic geometry, Bed slope.

Three methods of relating channel slope and channel capacity were presented for studies of channel geometry. The methods were illustrated by analysis of field measurements from 50 sites in the River Dart of mid-Devon, England. The first method was an inverse relationship between channel capacity and slope. In the second method, the relation between net channel slope and the rate of increase of channel capacity relative to drainage area for six individual tributaries within the overall channel network showed that the rate of increase of channel capacity is least where relief ratios are highest. Finally a regression relationship between channel capacity and slope was presented. (Terstriep-ISWS)
W76-10698

LINEAR AND NONLINEAR APPROACHES FOR SHORT-TERM RUNOFF ESTIMATIONS IN TIME-INVARIANT OPEN HYDROLOGIC SYSTEMS,
Thessaloniki Univ., Salonika (Greece). Hydraulics and Land Reclamation Lab.
Z. G. Papazafiriou.
Journal of Hydrology, Vol. 30, No. 1/2, p 63-80, May 1976. 4 fig, 2 tab, 16 ref.

Descriptors: *Linear programming, *Runoff, *Time, *Hydrologic systems, Non-uniform flow, Hydraulics, Rainfall, Discharge(Water), Estimating.
Identifiers: *Nonlinear programming, *Short-term runoff, *Time-invariant, Open hydrologic systems.

Open time-invariant linear and second-order nonlinear hydrologic systems with memory can be evaluated by the development of a method of expanding the kernels in sequences of unit-weighted orthonormal polynomials. The method was applied to the total rainfall-total discharge relationship. The watershed responses derived by the second-order nonlinear system demonstrated high sensitivity to input variations and predicted the runoff closely. The first-order system provided rather insensitive responses to input variations different from those encountered during the test period. Only hourly rainfall and runoff rates were used in order to study the short-term watershed reactions. Due to the limitations of the computer system available, the length of the studied periods was limited. The length of these periods could be expanded using longer time intervals such as 3-hour, 6-hour, or one-day intervals. (Roberts-ISWS)
W76-10699

SELECTION OF TYPICAL SMALL DRAINAGE BASINS FOR INVESTIGATING AND COMPUTING SPRING RUNOFF FROM LARGE RIVER BASINS,
For primary bibliographic entry see Field 4A.
W76-10705

FLOW RESISTANCE IN BROAD SHALLOW GRASSED CHANNELS,
Utah Water Research Lab., Logan.
C-L. Chen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11994, p 307-322, March 1976. 2 fig, 32 ref, append. FHA DOT-FH-11-7806.

Descriptors: *Flow friction, *Flow resistance, *Roughness(Hydraulic), Fluid mechanics, *Grassed waterways, Friction, Hydraulics, Roughness coefficient, Sheet flow, Channel flow, Mannings equation, Darcy-Weisbach equation, Reynolds number, Hydraulic models, Laboratory tests, Surface runoff, Turf, Kentucky bluegrass, Bermudagrass, Retardance.
Identifiers: *Manning's roughness, *Shallow channels, Retardance coefficient.

Resistance to sheet flows over natural turf surface was investigated experimentally. The formulation of a functional relationship between the resistance coefficient and controlling parameters for shallow flows over various turf surfaces is essential to the mathematical modeling of the rainfall-runoff process and sediment yield from a watershed which may consist of various vegetated surfaces. An analysis of results obtained from laboratory experiments for laminar flow on Kentucky Blue grass and Bermuda grass surfaces revealed that a relationship exists between the Darcy-Weisbach friction coefficient, Reynolds number, and bed slope. A further analysis of previous investigators' experimental results for flow on various smooth and rough surfaces with or without rainfall led to the qualitative determination of a general trend of the resistance relationship for shallow flows over such dense turf surfaces as affected by bed slope, raindrop impact, and roughness size. (Terstriep - ISWS)
W76-10710

A LABORATORY INVESTIGATION OF THE MECHANICS AND HYDRAULICS OF RIVER ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2C.
W76-10714

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS IN AN OSCILLATORY TURBULENT BOUNDARY LAYER,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W76-10916

ON ROLLING-GRAIN RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W76-10917

LONGITUDINAL DISPERSION FOR FLOW OVER ROUGH BEDS,
New Brunswick University, Fredericton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10921

CHANNEL WIDTH AND THE RIFFLE-POOL SEQUENCE,
Lanchester Polytechnic, Coventry(England).
K. S. Richards.
Geological Society of America Bulletin, Vol. 87, No. 6, p 883-890, June 1976. 8 fig, 37 ref.

Descriptors: *Geomorphology, *Channels, *Europe, Channel morphology, Meanders, Topography, Streams, Geology, On-site investigations, Fourier analysis.
Identifiers: *Riffle pool, *Channel width, England, Series analysis.

Investigations of channel geometry in a headwater stream in Cornwall, England, revealed that systematic variations of channel width occur in conjunction with the oscillations of bed topography in the riffle-pool sequence. The channel tends to be about 15% wider in the riffle section, where central bars of coarse bed material divert the flow against the banks. This is reflected in the occurrence of distinct downstream trends of width as a function of bankfull discharge in riffle and pool sections. There is some evidence that the widest channel occur just downstream from the summit of the riffle, which indicates that the width oscillation lags behind the profile oscillation, presumably because it is related to flow characteristics induced by bed topography. (Lee - ISWS)
W76-10924

APPLICATION OF A RESIDENCE TIME MODEL TO DILUTION GAUGING, WITH PARTICULAR REFERENCE TO THE PROBLEM OF CHANGING DISCHARGE,
Institute of Hydrology, Wallingford (England).
K. Gilman.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 523-537, December 1975. 8 fig, 3 tab, 9 ref.

Descriptors: *Flow, *Flow measurement, *Runoff, Stream gages, *Discharge measurement, Storm runoff, Simulation analysis, Tracers, Hydrographs, Model studies, Discharge(Water).
Identifiers: *Dilution gaging, *Changing discharges, Continuous injection, Digital simulation, Gaging accuracy.

The theory of the continuous injection method of dilution gaging requires that the stream discharge remains constant during the gaging. In this paper the effect of changing discharge was studied using a model based on the residence time of fluid elements in the gaging reach, and digital simulation showed that the systematic error caused by changing discharge is greatest at the start of storm runoff where the error, which is negative in sign, may be in excess of 60% of the discharge for steeply rising hydrographs. Dilution gaging is accurate when performed on the recession limb of a hydrograph, less so when performed late on the rising limb, and most unreliable immediately after the start of a storm hydrograph. (Morris-ISWS)
W76-10935

APPLICATION OF FINITE ELEMENT METHOD TO OPEN CHANNEL FLOW,
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydraulics and Catchment Hydrology.
For primary bibliographic entry see Field 8B.
W76-10939

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-10940

A DISCRETE LINEAR CASCADE MODEL FOR HYDROLOGY,
University Coll., Galway (Ireland).
K. M. O'Connor.
Journal of Hydrology, Vol. 29, No. 3/4, p 203-241, April 1976. 6 fig, 13 ref.

Descriptors: *Model studies, *Unit hydrographs, *Flood routing, *Synthetic hydrology, *Time series analysis, Hydrologic data, Analytical techniques, Parametric hydrology, Mathematical studies, Hydrology, Reservoirs.

Identifiers: *Linear cascade model, White noise, ARMA-type model.

The discrete analogies of the classical Muskingum and the equal-reservoir cascade models were compared with the ARMA-type models used in the generation of synthetic time series. Applying the cascade concept to the ARMA-type difference equation and including a pure translation parameter, a family of discrete linear parametric models were developed. Expressions were derived for the direct estimation of model parameters by cumulants for the general input-out case and for the special case of a white-noise input. The family of models can be applied in unit-hydrograph analysis, in flood routing, and in the generation of synthetic time series. The general ARMA-type cascade model was shown to be flexible, parsimonious, and applicable to the three areas of hydrology where linear models are used. (Singh - ISWS)
W76-10946

STEADY LAMINAR FLOW IN A STATIONARY TANK WITH A SPINNING BOTTOM,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 8B.
W76-11062

TECHNIQUES FOR ESTIMATING FLOOD DEPTHS FOR OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 4A.
W76-11075

HYDROLOGIC EFFECTS OF STORMS OF JUNE 24-28, 1974 IN LEE AND COLLIER COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-11077

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER IN TOWNS OF FRANKFORT AND SCHUYLER, HERKIMER COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W76-11079

FLOOD FREQUENCY OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W76-11083

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-11084

SIMPLIFIED ROUTING OF DAM BREAK WAVES,
Geological Survey, Bay St. Louis, Miss., and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-11085

2F. Groundwater

AN EMPIRICAL NA-K-CA GEOTHERMOMETER FOR NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-10598

CONFORMITY OF GROUNDWATER RECHARGE RATE BY TRITIUM METHOD AND MATHEMATICAL MODELLING,
National Geophysical Research Inst., Hyderabad (India).
B. S. Sukhija, and C. R. Shah.
Journal of Hydrology, Vol. 30, No. 1/2, p 167-178, May 1976. 4 fig, 2 tab, 16 ref.

Descriptors: *Groundwater recharge, *Tritium, *Mathematical models, Aquifers, Hydrologic data, Hydrologic budget, Isotope studies, Diffusion, Hydrogeology, Groundwater, Evapotranspiration, Equations.
Identifiers: *India(Gujarat).

Environmental tritium profiles studied over an interval of two years in a semi-arid region of western India (Gujarat) have been utilized to evaluate groundwater recharge to unconfined and confined aquifers. The recharge rate (11% of local rainfall) determined for confined aquifers for a part of the selected area using a diffusion-type unsteady groundwater flow model was in fair agreement with that determined using the tritium method. The tritium method wherever applicable has the advantages of being direct, fast, economical and does not require much hydrological data. (Visocky - ISWS)
W76-10700

WATER TRACING IN TROPICAL REGIONS, THE USE OF FLUOROMETRIC TECHNIQUES IN JAMAICA,
Bristol Univ. (England). Dept. of Geography.
P. L. Smart, and D. I. Smith.
Journal of Hydrology, Vol. 30, No. 1/2, p 179-195, May 1976. 3 fig, 5 tab, 26 ref.

Descriptors: *Tracers, *Fluorescent dye, *Dyes, *Tracking techniques, Tropical regions, Rhodamine, Dye dispersion, Fluorescence, Indicators, Water properties, *Groundwater movement, Karst, Water sources, Analytical techniques, Analysis, Organic compounds, Suspended solids, Path of pollutants.
Identifiers: *Water tracing, *Fluorometric techniques, *Jamaica, Spore tracing techniques, Optical brighteners.

Fluorescent dyes have been widely used in temperate latitudes for the tracing of karst groundwater. These tracers have been much less satisfactory in tropical karst areas, and are far less successful than Lycopodium spore tracing techniques. Quantitative tests were carried out on six fluorescent tracers in a surface stream in central Jamaica. Tracer concentrations were used in conjunction with discharge measurements to determine tracer losses under field conditions. Rhodamine WT and Lissamine FF proved to be the most successful dyes but Fluorescein also proved satisfactory under conditions with little direct sunlight. The optical brighteners Photine CU and Photine CSP showed large losses in the study reach. An underground test along a previously proven connection supported the findings of the surface tests. Two successful groundwater traces were completed in the North St. Catherine Basin, the first 30 km long using Rhodamine WT and the second over 14 km using Photine CU. The latter indicated that Photine CU was useful for the establishment of flow paths despite its relatively poor persistence. The conclusions were that selected fluorescent dyes are suitable for water tracing in tropical limestone regions provided a sensitive fluorometer is used for the analysis. The use of activated charcoal detectors is not recommended but the effects of suspended sediment and bacteria in the stream water are not thought to be limiting factors. A detailed comparison, including costings, of dye tracing and spore methods was given. (Henley - ISWS)
W76-10701

INVESTIGATION OF THE HYDROLOGIC CHARACTERISTICS OF TALUS,
I. S. Sosedov.
Soviet Hydrology: Selected Papers, No. 6, p 414-424, 1974. 3 fig, 2 tab, 5 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute, (Trudy Kaz-NIGMI), No. 50, p 3-19, 1973.

Descriptors: *Talus, *Hydrology, *Geomorphology, Asia, Erosion, Rocks, Weathering, Degradation(Slope), Particle size, Mountains, Slopes, Hygroscopic water, Elevation, Avalanches, Albedo, Mudflows, Subsurface runoff, Thermal radiation, Porosity, Moisture content, Snowpacks.
Identifiers: Hygrothermal regimes, USSR.

An investigation of the hydrologic effect of talus was conducted between 1968 and 1971 on the northern slope of the Trans-Ili Ala-Tau in Soviet Central Asia. Particle-size distribution and morphology of taluses, the accumulation and movement of water, radiation condition, and the annual and daily cycles of hydrothermal conditions above and inside a talus were studied. The results of the investigations showed that taluses, which are widespread in many mountain regions, have some significant water exchange characteristics that depend on petrographic composition, origin, rock size, and regional climatic conditions. Taluses prevent water erosion and wind transport of snow, the formation of snow avalanches, floods and mudflows, regulate runoff by changing it into subsurface runoff, and considerably reduce evaporation losses. The hydrophysical and hydrologic properties of taluses vary regularly and substantially with absolute elevation and slope exposure. (Visocky - ISWS)
W76-10706

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10718

PUBLIC GROUNDWATER SUPPLIES IN MCHENRY COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10719

AN ANALOG MODEL OF THE CHIPUXET AQUIFER, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
W. E. Kelly.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 767, $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 21 p, 6 fig, 13 ref. OWRT A-056-RI(2), 14-31-0001-6041.

Descriptors: *Computer models, Streambeds, Infiltration, Analog computers, Digital computers, *Model studies, *Groundwater, *Analog models, *Aquifers, *Rhode illsland, Streamflow, *Surface-groundwater relationships.
Identifiers: *Chipuxet aquifer(RI).

Analog and digital models of the Chipuxet aquifer were designed, constructed and verified. Steady-state response was matched both to the late summer (1959) water table and the observed baseflow-(recharge) water level relation on a monthly basis; the observed and predicted baseflow-water level relation are in good agreement for the drier months. The model was then applied to test a typical development scheme. The model performed satisfactorily but more study is needed to establish criteria for evaluating effects on streamflow. For evaluating stream depletion preliminary results are presented which show that an evaluation of the response of the aquifer to a

step change in stream stage, which is easily done with the analog model, also gives the stream depletion response to a step change in pumping rate. This result if it is substantiated by further study greatly simplifies analog model measurements.
W76-10814

FIELD AND LABORATORY EVALUATION OF BI-LEVEL DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-10934

ROLE OF PRECIPITATION IN THE CHEMISTRY OF SUBSURFACE WATERS IN THE WESTERN PART OF THE TURGAY TROUGH,
R. M. Kurmangaliyev.
Soviet Hydrology, Selected Papers, No. 6, p 396-400, 1974. 2 tab, 11 ref. Translated from Transactions of the Institute of Hydrogeology and Hydrophysics, Academy of Sciences of the Kazakh SSR, Vol. 5, p 146-151, 1974.

Descriptors: *Subsurface waters, *Groundwater basins, *Water chemistry, *Precipitation(Atmospheric), *Fissures(Geologic), Groundwater movement, Geologic control, Infiltration, Groundwater recharge, Seepage, Leaching, Salts, Base flow, Zone of aeration Bicarbonates, Sodium, Chlorides, Melt water, Quaternary period.
Identifiers: *Russia, Troughs, Mantle.

The study area is on the western edge of the Turgay trough, at its boundary with the folded region of the Eastern Trans-Ural. The hydrogeological conditions are very complex, but most commonly the subsurface waters are associated with the upper fissured zone of metamorphic, sedimentary, effusive-sedimentary, and intrusive rock complexes of pre-Paleozoic to middle Palezoic age. These waters are of the fissure, fissure-karst, and fissure-vein type. Their main source of reharge is precipitation, especially in winter , but seepage of surface waters during high stages is also important. The fissure waters of Paleozoic and pre-Paleozoic rocks are mostly of the sodium chloride and chloride-hydrocarbonate sodium class, while the pore waters of the middle Oligocene and Quaternary deposits vary greatly in mineral content. The leaching of salts from the unconsolidated Quaternary mantle and from the weathering crust, as well as their supply with precipitation, are the main sources of salts in the fissured waters. (Visocky - ISWS)
W76-10942

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
Zh. S. Sydykov, I. B. Dal'yan, N. E. Zeyberlikh, and M. A. Mukhamedzhanov.
Soviet Hydrology, Selected Papers, No. 6, p 389-396, 1974. 3 fig, 2 tab, 11 ref. Translated from Transactions of the Institute of Hydrogeology and Hydrophysics, Academy of Sciences of the Kazakh SSR, Vol. 5, p 113-120, 1974.

Descriptors: *Subsurface waters, *Aquifers, *Mesozoic era, Water resources, Water supply, Geologic investigations, Porosity, Permeability, Geologic units, Structural geology, Electrical well logging, Water chemistry, Water quality, Water wells, Groundwater basins.
Identifiers: *Erosion troughs, *Russia, *Ural Anticlines.

Erosion troughs in Mesozoic deposits are very common in the Aktyuba region of the Ural. They are confined to the roofs of Paleozoic salt anticlines, and their formation is associated with the dissolution of halogenic-sulfate rocks of the Kungur formation by subsurface waters and the gradual subsidence of the overlying rocks. They developed particularly rapidly in the Lower and Middle Jurassic and Albian, and, therefore, these deposits are thickest in the central parts of the troughs. Recent geological-geophysical investigations have established that large aquifers are widespread in the Middle Jurassic and Albian sand deposits. These aquifers contain confined water suitable for drinking, agriculture, and large industrial enterprises. Preliminary computations suggest that these subsurface waters can be extensively used for water supply. (Visocky - ISWS)
W76-10943

GROUNDWATER,
Geological Survey, Reston, Va.
A. I. Johnson, and G. Meyer.
Review of Geophysics and Space Physics, Vol 13, No 3, p 455-458, p. 505-517, July 1975.

Descriptors: *Reviews, *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Bibliography, Surface-groundwater relationships, Pumping, Water pollution sources, Groundwater movement, Land subsidence, Zone of saturation, Water demand, Water supply.

Ground water resources are reviewed for the period 1971-1974. The attitude toward ground water changed during that time, with all phases of the water-interested community seeing ground water from new perspectives. Ground water became recognized more fully as an important natural resource worthy of formal management, regulation, and realistic conservation. Emphasis on predictive ground-water management and protection has resulted in greater need for quantitative data and understanding. Data acquisition and research activity has concentrated on aquifer storage and yield, artificial and natural recharge and discharge, and effects of development on the hydrology of urban and urbanizing areas. The expansion of water management practice has created greater attention on conjunctive development of surface and ground-water supplies and on multidisciplinary studies. Future trends in groundwater data-acquisition and research studies are expected to increase toward problems related to ground-water pollution, deep waste-disposal, and solid-waste or landfill operations. Studies will become increasingly interdisciplinary, with more concern with social, economic, and legal aspects of water planning and management. A selected list of about 500 important books and papers published on ground water during 1971-1974 is included with the paper. (Woodard-USGS)
W76-11066

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-11068

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-11070

GROUND-WATER LEVELS IN NEW MEXICO, 1974,
Geological Survey, Albuquerque, N. Mex.
J. D. Hudson.
New Mexico State Engineer Basic-Data Report, Santa Fe, 1976. 112 p, 34 fig, 64 tab.

Descriptors: *Water levels, *Groundwater, *Observation wells, *Basic data collectiions, *New Mexico, Aquifers, Water level fluctuations, Hydrographs, Bibliographies, Publications.

Water levels are measured periodically in a network of about 1,400 observation wells in New Mexico to record changes in ground-water storage. The areas of water-level observation are within seven of the nine major surface-water drainage basins; most are in areas where ground water is used in large quantities for irrigation, municipal, or industrial purposes. Measurements tabulated in this report were made in January or February 1975 and reflect water-level changes during 1974 when compared with measurements made in January or February 1974. Included is a bibliography of papers and publications pertaining to ground water in New Mexico published or released to the open file in 1974, with additions from 1948-73, authored by R. L. Borton. (Woodard-USGS)
W76-11073

GEOHYDROLOGY OF THE ANZA-TERWILLIGER AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-11074

2G. Water In Soils

EFFECT OF CATTLE FEEDYARD RUNOFF ON SOIL INFILTRATION RATES,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5B.
W76-10538

EFFECT OF SOIL-INCORPORATED DAIRY CATTLE MANURE ON RUNOFF WATER QUALITY AND SOIL PROPERTIES,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 5B.
W76-10539

SORPTION CAPABILITIES OF SOILS FOR PHOSPHATE REMOVAL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
For primary bibliographic entry see Field 5D.
W76-10673

INVESTIGATION OF THE HYDROLOGIC CHARACTERISTICS OF TALUS,
For primary bibliographic entry see Field 2F.
W76-10706

TRANSPORT OF WATER AND HEAT IN A FROZEN PERMEAMETER,
Cornell Univ., Ithaca, N. Y. Dept. of Agronomy.
R. D. Miller, J. P. G. Loch, and E. Bresler.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1029-1036, November-December 1975. 4 fig, 1 tab, 16 ref. NSF GK-42050, Army DA-ENG-27021-72-G32.

Descriptors: *Frozen soils, *Permeameters, *Instrumentation, *Mass transfer, *Groundwater movement, *Soil water, Equations, Frozen ground, Ice, Convection, Heat transfer, Mathematical studies, Flow, Saturated flow.
Identifiers: *Water transport, *Heat transport, Mass transport, Frozen water, Ice sandwich, Claypeyron equation.

Transport of water in frozen soils is probably not restricted to fluid phases. In a frozen permeameter a series-parallel mode of transport should exist in which the ice phase may move with uniform translational velocity in a stationary pore system

formed by particles having adsorbed films of unfrozen water. A microscopic model for coupled mass and heat transport would be complex, but foundations for such a model were laid in an exercise which derives direct and cross coefficients for coupled transport equations applicable to a permeameter containing a simplified (nontortuous) 'soil' with uniform cylindrical channels, ice-filled except for films adsorbed at channel walls. Temperature dependence of coefficients, assuming Newtonian shear in the film, can be modeled using standard double-layer theory. It was shown that the resultant coefficients are relatively insensitive to temperature (film thickness) but are highly dependent on thermal conductivities of components. Identity of cross-coefficients in this mechanical model was demonstrated. Expressions for computing phenomenological soil coefficients from coefficients measured in a practical permeameter were given and a workable permeameter for such studies was postulated. (Prickett - ISWS)
W76-10713

LAND APPLICATION OF SEWAGE SLUDGE, III. NITRATE ACCUMULATION AND WHEAT GROWTH RESULTING FROM ADDITION OF SEWAGE SLUDGE AND WOOD WASTES TO SOILS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W76-10841

PREDICTING CONSUMPTIVE USE WITH CLIMATOLOGICAL DATA,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W76-10873

CAPILLARY HYSTERESIS AND THE RELATIONSHIP BETWEEN DRYING AND WETTING CURVES,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
Water Resources Research, Vol. 12, No. 2, p 224-228, April 1976. 5 fig, 24 ref.

Descriptors: *Hysteresis, *Soil moisture, *Mathematical models, Theoretical analysis, Equations, Wetting, Drying, Pore water, Capillary action, Pores, Groundwater potential, Air-water interfaces, Boundary processes, Saturation, Sands, Silts, Loam, Soils, Microenvironment, Infiltration.
Identifiers: *Wetting scanning curve, *Drying scanning curve, Rubicon sandy loam, Caribou silt loam, Experimental results.

A simple microscopic model predicted the wetting and drying scanning curves from only one boundary of the main hysteresis loop. Comparison with experiments showed that if the shape of the drying scanning curves varies smoothly, then the drying boundary of the loop is indeed sufficient to predict all scanning curves. However, if the shape of the drying curves changes abruptly, the model is still applicable, but the drying boundary yields only the wetting scanning curves, and the wetting boundary yields only the drying scanning curves. For this case the model seems more reliable for predicting the scanning curves than for the application of interpolation techniques between the two boundaries. (Visocky - ISWS)
W76-10914

PULSED DISPERSION OF TRACE CHEMICAL CONCENTRATIONS IN A SATURATED SORBING POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Statistics; and Oregon State Univ., Corvallis. Dept.of Mathematics.
For primary bibliographic entry see Field 5B.
W76-10915

SEEPAGE FLOW THROUGH HOMOGENEOUS SOIL INTO A ROW OF DRAIN PIPES,
Waikato Univ., Hamilton (New Zealand). Dept. f Mathematics.
For primary bibliographic entry see Field 4A.
W76-10919

SOIL WATER MODELING I: A GENERALIZED SIMULATOR OF STEADY, TWO-DIMENSIONAL FLOW,
Agricultural Research Service, Columbia, Mo. North Central Region Watershed Research Center.
C. R. Amerman.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 466-470, May-June 1976. 6 fig, 21 ref.

Descriptors: *Soil water, *Model studies, *Computer models, *Soil water movement, Boundaries(Surfaces), Hydraulic conductivity, Pressure head, Numerical analysis, Darcys law, Unsaturated flow, Equations, Porous media, Theoretical analysis, Steady flow.
Identifiers: *Richards equation, Successive over-relaxation, Subsectioning, Finite-difference approximation.

A computational scheme was developed for solving the steady-state, two-dimensional form of Richards' equation using finite differencing. The successive over-relaxation method was used. The computer model developed for implementing the computational scheme was generalized using a technique called subsectioning, which allows application of the model, without internal modification, to a wide range of geometric shapes, hydraulic boundary conditions, and soil distributions. Unsaturated or saturated flow regions or those containing phreatic surfaces may be modeled. The nonlinear nature of Richard's equation was reflected in the overrelaxation coefficient which had a maximum rather than an optimum value. Values higher than maximum caused instability. (Visocky-ISWS)
W76-10933

WASTE APPLICATION TO SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11042

BEEF CATTLE FEEDLOTS: IMPACT ON UNDERLYING SOIL,
Agricultural Research Service, Ft. Collins, Colo.
For primary bibliographic entry see Field 5B.
W76-11047

2H. Lakes

ECOLOGICAL VARIABILITY OF BREAM IN LITHUANIAN WATERS: 2. AGE AND GROWTH RATE, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parizitologii.
For primary bibliographic entry see Field 5C.
W76-10519

SOME DATA ON ZOOPLANKTON OF RESERVOIRS IN THE MARY AND CHARDZHOU REGIONS OF THE TURKMEN SSR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Zoologii i Parazitologii.
Z. M. Zamaimuradova.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 6, p 74-75, 1974.

Descriptors: *Reservoirs, *Zooplankton, Biomass, *Analysis, Plankton, Copepoda, Crustaceaus.
Identifiers: Alona-Rectangula, Asplanchna-Brightwelli, Brachionus-Bennini, Brachionus-Calyciflorus, Brachionus-Capsuliflorus, Brachionus-Quadridentatus, Euchlanis-Dilatata, Filinia-Longiseta, Keratella-Quadrata, Lecane-Luna, Monostyla-Bulla, Nitocra-Sp., Turkmen SSR, USSR, Rotatoria.

In the Mary and Chardzhou Reservoirs (USSR) 12 spp. of zooplankdton (Asplanchna brightwelli, Brachious calyciflorus, B. capsuliflorus, C. quadridentatus, C. bennini, Euchlanis dilatata, Keratella quadrata, Lecaneluna, Alona rectangula, Monostyla bulla, Filinia longiseta, Nitocra sp.) were recorded. Included were 10 spp. of Rotatoria; 1, Cladocera; and 1, Copepoda. The former predominate in zooplankton in quality and quantity. Their number varies from 40-10,000/m3, biomass from 0.08-33 mg/m3. Low rates of zooplankton development were recorded in the reservoirs of the Mary region during the spring-summer period.--Copyright 1976, Biological Abstracts, Inc.
W76-10520

SOME CHARACTERISTICS OF SPLEEN GROWTH IN THE LAKE MINNOW, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2I.
W76-10521

REPORT OF KELLY'S FALLS POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10525

REPORT ON POWDER MILL POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10526

REPORT ON GLEN LAKE, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10527

REPORT ON SEBASTICOOK LAKE, PENOBSCOT COUNTY, MAINE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10528

REPORT ON LAKE WINNEPESAUKEE, CARROLL AND BELKNAP COUNTIES, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-10529

ON THE CALCULATION OF THE MEAN RESIDENCE TIME IN MONOMICTIC LAKES,
Commission of the European Communities, Ispra (Italy). Joint Nuclear Research Center.
G. Rossi, V. Ardente, F. Beonio-Brocchieri, and E. Diana.
Hydrological Sciences Bulletin, Vol. 20, No. 4, p 575-580, December 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Lake morphology, Numerical analysis, *Thermocline, Epilimnion, Inflow, Stratified flow, Homogeneity, Basins, Oligotrophy, Lakes, Thermal properties.

Identifiers: *Residence time(Lake water), *Monomictic lakes, *Lake Maggiore(Italy), *Lake Lugano(Italy), Dilution coefficient, Pluriannual cycle.

A general method for the calculation of the mean residence time of water in monomictic lakes of simple morphometry was worked out on the same physical assumptions as those made by Piontelli and Tonelli (1964). After a short outline of the mathematical foundation of the method, the numerical procedure was presented on which the computer code for the determination of the mean residence time was based. Finally some examples of the application of the method to Lake Maggiore and to a lake of complex morphometry (Lake of Lugano) were presented and discussed. (Roberts - ISWS)
W76-10704

DISTRIBUTION OF STREAM POLLUTION IN LAKE WATER,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W76-10712

A NORMAL MODE METHOD FOR PREDICTING STORM SURGES ON A LAKE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. J. Schwab.
Special Report No. 20, November 1975. 63 p, 15 fig, 3 tab, 19 ref, 2 append. NSF GA-32204.

Descriptors: *Storm surge, *Forecasting, *Tidal energy, Mathematical studies, *Lake Ontario, *Energy dissipation, *Great Lakes, Numerical analysis, Energy equation, Lakes, Surface waters, Waves(Water), Flow, Hydraulics, Mathematics, Equations, Winds, Atmospheric pressure, Water levels.
Identifiers: *Normal mode method, Lake energy, Finite difference method, Tidal forcing, Griddisperson, Lake oscillations, Dynamical equations.

A mathematical procedure for determining the two-dimensional time-dependent response of a rotating lake with arbitrary topography was presented. The procedure depends on prior knowledge of the normal modes of oscillation of the lake. These may be found numerically for an arbitrary lake by the method of Rao and Schwab (1974). The space-dependent part of the forced solution is represented by an expansion in terms of the spectrum of normal modes. This results in a system of uncoupled first-order inhomogeneous differential equations which depend only on time and can be solved simply and efficiently by implicit numerical integration. The normal mode method avoids the problem of grid-dispersion inherent in the traditional approach of direct finite difference integration of the governing equations on a numerical space-time grid. It is also more economical in terms of computation time than the finite difference method, and provides physical insight by determining exactly how the total energy of the lake is distributed among the individual modes. Results of the application of this technique to an ideal rectangular basin compared well with the solution by a finite difference technique. Favorable comparisons were also obtained for a natural basin, Lake Ontario, subjected to a uniform wind stress and a natural wind stress. The computational efficiency of the normal mode technique is evident in all cases. An appendix compares the results of these two-dimensional methods to the solution of the channel equations for Lake Ontario with uniform wind stress. (Henley - ISWS)
W76-10715

TROPIC STATUS OF SELECTED NORTHERN NEW MEXICO LAKES,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10808

A SIMULATION MODEL OF TRITIUM KINETICS IN A FRESHWATER MARSH,
Ohio Cooperative Wildlife Research Univ, Columbus.
For primary bibliographic entry see Field 5B.
W76-10812

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
R. L. Street.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 764, $4.50 in paper copy, $3.00 in microfiche. Technical Report No. 203, January 1976, 44 p, 18 fig, 25 ref. OWRT C-3033(No 3675)(3).

Descriptors: Path of pollutants, Themocline, *Thermal pollution, *Lakes, *Computer models, *Reservoirs, Numerical analysis, Digital computers, *Simulation analysis, Circulation, Thermal stratification, Model studies, Mathematical models, Hydrodynamics, Reviews, *Hydraulic models, Dimensional analysis.
Identifiers: Hydrostatic models.

The work led to development of (i) a time-dependent, three-dimensional numerical model which simulates the hydrodynamic and thermal regime of lakes and reservoirs and (ii) a two-dimensional (horizontal-vertical) hydrostatic numerical model for simulation of hydrodynamics and thermal regimes(e.g., thermocline development) in long and narrow reservoirs and lakes. Both models employ MAC space-staggered grids, explicit time-stepping, the Boussinesq approximation, and a spatially-and time-variant eddy viscosity model. A literature review establishes the range of successful, numerical finite-difference, three-dimensional models that are available. The conclusions suggest that three-dimensional hydrostatic models and laterally-averaged two-dimensional models provide the best opportunities for economic and quantitatively accurate simulations.
W76-10813

DEVELOPMENT OF A WATER QUAITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W76-10815

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W76-10950

BACTERIOPLANKTON AND ITS SIGNIFICANCE IN THE BIOPRODUCTIVITY OF THE RESERVOIRS, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-10969

MARKED DIMINUTION OF DISSOLVED OXYGEN IN THE HYPOLIMNION OF LAKE BIWA IN AUGUST, 1973, (IN JAPANESE),
Nara Women's Univ. (Japan). Zoological Inst.
For primary bibliographic entry see Field 5C.
W76-10976

ZOOPLANKTON OF LAKES OF THE BOL'SHEZEMEL-SKAYA TUNDRA, (IN RUSSIAN),
Ministerstvo Selskogo Khozyaistva, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W76-11056

BOG STRATIGRAPHY, RADIOCARBON DATES, AND PINEDALE TO HOLOCENE GLACIAL HISTORY IN THE FRONT RANGE, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2C.
W76-11071

2I. Water In Plants

SOME CHARACTERISTICS OF SPLEEN GROWTH IN THE LAKE MINNOW, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
I. N. Brusynina.
Ekologiya. 6(2), p 86-88, 1975.

Descriptors: *Lakes, *Fish genetics, *Fish populations, *Fish physiology, *Minnows, Growth rates.
Identifiers: Minnow, Phoxinus-Percnurus, *Spleen(Fish).

The Lake minnow Phoxinus percnurus was investigated in the foothills of the Polar Urals. The relative weight of the spleen decreases with age. The minnow responds to unfavorable environmental conditions by an increase of weight of the spleen. Sexual dimorphism with respect to relative spleen weight was not displayed clearly. Differences in the weight of the spleen of minnows of the same age and sex in different years can be attributed to the population density.--Copyright 1976, Biological Abstracts, Inc.
W76-10521

PRODUCTION RESPONSE OF THE BLUEGILL SUNFISH, LEPOMIS MACROCHIRUS RAFINESQUE, TO ADDED ATTACHMENT SURFACE FOR FISH-FOOD ORGANISMS,
North Carolina Cooperative Sport Fishery Unit, Raleigh.
G. B. Pardue.
Trans Am Fish Soc. 102(3), p 622-626, 1973.

Descriptors: *Sunfishes, *Fish food organisms, Fertilization, Fish reproduction, Nitrogen, Potassium, Phosphorus, Fish diets.

Bluegill sunfish, L. macrochirus, were stocked at a rate of 20,000/ha into 40 plastic pools, each 3 m in diameter, containing water to a depth of 76 cm. Added attachment surfaces (yellow pine boards) for fish-food organisms were placed in 36 plastic pools in amounts corresponding to 20, 40, 60, 80, and 100% of the water surface area. Fertilizers with 8-8.2 (N-P-K), 0-8-0 (N-P-K) and a control with no fertilizer were used throughout the study. The addition of pine boards resulted in linear increases in both fish food and fish production. Significant increases occurred when additions of attachment surface equal to the surface area of the pool were added. Complete (8-8-2, N-P-KO fertilization produced the greatest weight of macroinvertebrates and bluegills.--Copyright 1974, Biological Abstracts, Inc.
W76-10522

UPSTREAM CHANGES IN FISH POPULATIONS FOLLOWING IMPOUNDMENT OF SAGEHEN CREEK, CALIFORNIA,
California Univ., Berkeley. School of Forestry and Conservation.
D. C. Erman.
Trans Am Fish Soc. 102(3), p 626-629, 1973.

Descriptors: *Fish populations, *California, Impoundments, Streams, Trout, Rainbow trout, Fish physiology.
Identifiers: Brook, Brown, California, Catostomus-platyrhynchus, Catostomus-tahoenis, Creek, Fish, Impoundment, Populations, Rainbow, Sagehen, Trout, Upstream, USA, Whitefish, Sagehen Creek(Calif).

Fish populations were compared before (1952-1961) and after (1970-1972) construction of Stampede Reservoir in a mile of Sagehen Creek (California USA) above the reservoir. Relative abundance and species composition were quite different after reservoir construction. Suckers (Catostomus platyrhynchus and C. tahoensis) are now numerically dominant (79% of all fish); whereas, formerly they made up 18% (by numbers) of the fish composition. Rainbow trout have increased, but brown trout and whitefish have decreased; brook trout have not been collected since impoundment. Reservoir construction is the only major change in the Sagehen Creek watershed.--Copyright 1974, Biological Abstracts, Inc.
W76-10619

PLANT MEASUREMENTS AS INDICATORS OF CROP WATER DEFICIT,
Southwestern Great Plains Research Center Bushland, Tex.
For primary bibliographic entry see Field 3F.
W76-10622

DIEL CHANGES IN THE FEEDING ACTIVITY AND FOOD HABITS OF THE SPOTFIN SHINER, NOTROPIS SPILOPTERUS (COPE),
Eastern Michigan Univ., Ypsilanti. Dept. of Biology.
S. T. White, and D. C. Wallace.
Am Midl Nat. 90(1), p 200-205, 1973.

Descriptors: Shiners, Dill migration, Fish diets, Diptera, Michigan, Fish food organisms.
Identifiers: Notropis-spilopterus, Spotfin shiner, Trichoptera.

A study of the diel changes in the feeding activity of N. spilopterus in the Huron River near Ann Arbor, Michigan, was based on samples taken at 3-h intervals for 24 h. The food in the stomachs of 263 spotfin shiners was examined. Based on stomachs with food, Trichoptera larvae, represented mainly by hydropsychids, accounted for the greatest volume (33%). Diptera larvae, represented by simulids and chironomids, were most frequent (50%). Both of these food items occurred in a high percentage of stomachs (54%). The major peak in stomach fullness occurred at 9:00 PM when 74% of all stomachs were 50% full. Most stomachs from fish collected at midnight were empty (85%). Feeding activity increased by 6:00 AM, but at a relatively low intensity. Fewer fish were feeding at noon than at 6:00 AM. However, at noon the feeding intensity was somewhat greater. During the day, especially at noon, smaller fish were feeding more intensely than larger fish. Both Trichoptera and Diptera larvae constituted an important proportion of the food through most of the daylight hours. Trichoptera larvae were much less important at dusk than Diptera larvae.--Copyright 1973, Biological Abstracts, Inc.
W76-10816

LIFE HISTORY AND ECOLOGY OF MEGARCYS SIGNATA (PLECOPTERA: PERLODIDAE), MILL CREEK, WASATCH MOUNTAINS, UTAH,
Utah Univ., Salt Lake City. Dept. of Biology.
M. R. Cather, and A. R. Gaufin.
Great Basin Naturalist, Vol. 35, No. 1, March 1975, p 39-48, 7 fig, 1 tab, 20 ref. EPA-5T2-WP-542-03.

Descriptors: Ecology, *Life history studies, *Stoneflies, *Growth rates, Feeds, Temperature, Utah, Diptera.
Identifiers: *Megarcys signata.

Nymphs of Megarcys signata were collected at least monthly from June 1971 to December 1972 at each of 6 stations. A comparison of the cumulative growth at all stations showed that the most rapid growth occurred at the warmest stations. Periods of maximum absolute growth corresponded to maximum carnivorous feeding. Chironomids seemed to be the preferred food item. Significant seasonal differences in food items were found in the guts of samples taken. Emergence began in early May and lasted until late June with peak emergence occurring in June. (Chilton-ORNL)
W76-10887

YIELD AND REMOVAL OF NUTRIENTS BY OAT PLANTS DEPENDING ON FERTILIZER RATES AND SOIL MOISTURE CONTENT, (IN BELORUSSIAN),
For primary bibliographic entry see Field 3F.
W76-10962

GERMINATION OF WEED SEEDS DEPENDING ON SOIL MOISTURE AND DENSITY, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W76-10965

2J. Erosion and Sedimentation

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10607

POLLUTIONAL EFFECTS OF SUSPENDED, SEDIMENTED AND ERODED PARTICULATE MATERIAL IN THE AQUEOUS ENVIRONMENT,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5C.
W76-10663

THE EVAPORATION AND SEDIMENTATION IN MAN-MADE ARADE LAKE, SOUTHERN PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 2D.
W76-10703

THE ABILITY OF DEBRIS, HEAVILY FREIGHTED WITH COARSE CLASTIC MATERIALS, TO FLOW ON GENTLE SLOPES,
Stanford Univ., Calif. Dept. of Geology.
J. D. Rodine, and A. M. Johnson.
Sedimentology, Vol. 23, No. 2, p 213-234, April 1976. 12 fig, 1 tab, 34 ref. USGS 14-08-001-10884, Army DA-ARA-D-31-124-71-G158.

Descriptors: *Sediment transport, *Debris avalanches, Sediments, Sedimentology, Coarse sediments, Particle size, Alluvial fans, Slopes, Fine aggregates, Sands, Friction, Detritus, Model studies, Laboratory tests, Strength, Density.
Identifiers: *Debris flow, Particle interlocking, Debris strength, Spherical particle model.

The paper described how debris charged with coarse granular material can transport large blocks, yet flow on gentle slopes. Experimental results of mixing sand-sized particles with a slurry of clay plus water indicated that 45-55 vol. % of a single size, and up to 64% of two selected sizes, can be added before interlocking occurs. Theoretical analysis of multi-size classes suggested that 89 to more than 95 vol. % debris can be clastic materials without significant particle interlocking. The clay fraction plays a critical role in determining strength properties of debris. The mixture of clay plus water provides a cohesive slurry that supports fine-grained particles within the debris and reduces the effective normal stresses between the particles. The increased unit weight of the clay plus water plus fine-grained particles allows the support of coarser grained particles. The pyramiding upon the clay-water slurry continues until the entire debris mass is supported in a virtually frictionless position because of the reduced effective normal stress and the lack of particle interlocking. The ability of debris flows to support large blocks can be understood in terms of the high unit weight of the displaced debris plus the strength of the fluid phase. Also, the ability of coarse clastic debris to flow on gentle slopes probably is a result of poor sorting of debris-flow materials which contain minor amounts of clay. (Lee - ISWS)
W76-10711

ON ROLLING-GRAIN RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
J. F. A. Sleath.
Journal of Hydraulic Research, Vol. 14, No. 1, p 69-81, 1976. 6 fig, 1 tab, 10 ref.

Descriptors: *Sediment transport, *Waves(Water), River beds, Laboratory tests, Boundary layers, Hydraulics, Fluid mechanics, Wavelengths.
Identifiers: *Rolling-grain ripples, Vortex ripples.

Analytical relations were derived for the wavelength of rolling-grain ripples formed by the action of water waves. Experiments with a tray of sediment oscillated in a tank of still water were reported. A theoretical investigation which was based on potential flow and the additional account of the variation of velocity in viscous boundary layer was also reported. Based on the experimental data, the relationship between ripple wavelength and median grain diameter of sediment, Reynolds number, water and sediment specific gravity and wave period were established. A regression equation was developed. The results indicated that, as the intensity of flow increases, sediment exchange between adjacent crests ceases to be neglible and ripple steepness decreases. At sufficiently high values of Reynolds number the vortex mechanism breaks down and the points should then follow the curve for rolling-grain ripples. (Lee - ISWS)
W76-10917

CHANNEL WIDTH AND THE RIFFLE-POOL SEQUENCE,
Lanchester Polytechnic, Coventry(England).
For primary bibliographic entry see Field 2E.
W76-10924

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-10925

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W76-10940

LOESS DISTRIBUTION BY VARIABLE WINDS,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
R. L. Handy.

Geological Society of America Bulletin, Vol. 87, No. 6, p 915-927, June 1976. 12 fig, 3 tab, 35 ref, append.

Descriptors: *Soils, *Sedimentation, *Loess, *Winds, Wind erosion, Wind velocity, Dusts, Dust storms, Distribution patterns, Equations, Variability, Sampling, On-site data collections, Model studies, Mathematical models.
Identifiers: *Loess distribution, *Variable winds, Loess thickness, Settling rate, Dust deposits.

Systematic decreases in loess thickness with distance from the source, usually considered to reflect a prevailing wind direction, may relate to variable wind directions. If winds blowing transverse to a linear source carry their load to a farthest distance, winds blowing at an angle to the source will distribute their load over a reduced distance, leading to a proportionate increase in thickness by a factor of the cosecant of wind blowing angle. Thus where wind blowing angle is small, for winds nearly parallel to the source, deposition should be limited to a narrow corridor adjacent to the source, leading to greater accumulations in this area. Representation of random wind directions by integration of the thickness equation gave a liner relationship between thickness and the logarithm of distance, as observed empirically along loess traverses and in sampling near dusty roads. Addition of a moderate prevailing wind to the variable wind model preserved the semilogarithmic thickness relation on the downwind side of the source but reduced thicknesses on the upwind side and substituted a nearly linear relationship between thickness and distance from the source. Loess thickness contours should be approximately parallel to the source regardless of the prevailing wind direction. The contours bulge outward adjacent to wider source areas, probably because of increased dust concentrations in the air. The variable wind hypothesis does not fully account for extraordinary thicknesses of loess within a few miles of the source. These extraordinary thicknesses appear to relate in part to a still-rising dust cloud and increased low-level dust concentrations in air close to the source. (Lee - ISWS)
W76-10941

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
For primary bibliographic entry see Field 2F.
W76-10943

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W76-10945

TIDE-INDUCED MASS TRANSPORT; A FLUSHING MECHANISM FOR SHALLOW LAGOONS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2L.
W76-10947

ESTIMATED EROSION RATES ON MOUNT RAINIER, WASHINGTON,
Washington Univ., Seattle. Dept. of Geological Sciences.
H. H. Mills.
Geology, Vol. 4, No. 7, p 401-406, July 1976. 3 fig, 2 tab, 20 ref.

Descriptors: *Erosion, *Sedimentation rates, *Washington, *Erosion rates, Sediment yield, Reservoir silting, Suspended load, Mountains, Rockslides, Melt water, Streams, Mudflows, Volcanoes.
Identifiers: *Mount Rainier(Wash), Debris loads, Lahars.

Denudation rates on Mount Rainier, Washington, were determined by estimating dissection of the original landform, volumes of glacial and lahar deposits, present sediment loads of meltwater streams, reservoir sedimentation rates, and superglacial debris loads. Rates are generally as great or greater than rates in other glaciated basins. The highest rates (3000 to 8000 mm/1000 yr) were indicated by stream-sediment loads and reservoir sedimentation; however, modern stream-sediment loads may be abnormally great because of the exposure of large amounts of unstable debris by twentieth-century glacier retreat. Catastrophic events, including lahars and large rockfalls, account for a substantial part of the total erosion. (Lee - ISWS)
W76-10951

SEDIMENTATION PROCESSES INVOLVING HYDROCARBONS IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11012

2K. Chemical Processes

AN EMPIRICAL NA-K-CA GEOTHERMOMETER FOR NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
R. O. Fournier, and A. H. Truesdell.
Geochim Cosmochim Acta. 37(5), p 1255-1275, 1973.

Descriptors: *Sodium, *Potassium, *Calcium, *Thermometer, Instrumentation, Natural water, Temperature, Energy, *Geothermal studies, Water analysis, Analytical techniques.
Identifiers: *Geothermometers, Water-rock interaction(Temperature).

An empirical method of estimating the last temperature of water-rock interaction was devised. It is based upon molar Na, K, and Ca concentrations in natural waters from temperature environments, ranging from 4-340C. The data for most geothermal waters cluster near a straight line when plotted as the function log (Na/K) + beta log ((Ca)/Na) vs. reciprocal of absolute temperature, where beta is either 1/3 of 4/3 depending upon whether the water equilibrated above or below 100C. For most waters tested, the method gives better results than the Na/K methods suggested by other workers. The ratio Na/K methods suggested by other workers. The ratio Na/K should not be used to estimate temperature if (MCa)/MNa is greater than 1. The Na/K values of such waters generally yield calculated temperatures much higher than the actual temperature at which water interacted with the rock. A comparison of the composition of boiling hot-spring water with that obtained from a nearby well (170C) in Yellowstone Park shows that continued water-rock reactions may occur during ascent of water even though that ascent is so rapid that little or no beat is lost to the country rock, i.e., the water cools adiabatically. As a result of such continued reaction, waters which dissolve additional Ca as they ascend from the aquifer to the surface will yield estimated aquifer temperatures that are too low. On the other hand, waters initially having enough Ca to deposit calcium carbonate during ascent may yield estimated aquifer temperatures that are too high if aqueous Na and K are prevented from further reaction with country rock owing to armoring by calcite or silica minerals. The Na-K-Ca geothermometer is of particular interest to those prospecting for geothermal energy. The method also may be of use in interpreting compositions of fluid inclusions.--Copyright 1974, Biological Abstracts, Inc.
W76-10598

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
For primary bibliographic entry see Field 5D.
W76-10627

IDENTIFICATION OF NUCLEI AND CONCENTRATIONS OF CHEMICAL SPECIES IN SNOW CRYSTALS SAMPLED AT THE SOUTH POLE,
Cold Regions Research and Engineering Laboratory, Hanover, N. H.
For primary bibliographic entry see Field 2C.
W76-10696

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W76-10832

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 5A.
W76-10910

WATER QUALITY CHARACTERISTICS OF THE ILLINOIS RIVER AT PEORIA,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5A.
W76-10922

AUTOMATED DETERMINATION OF CARBON IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10936

MODIFIED CURCUMIN AND DIANTHRIMIDE METHODS FOR THE DETERMINATION OF BORON IN THE PRESENCE OF HIGH LEVELS OF NITRATE AND ORGANICS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10937

ROLE OF PRECIPITATION IN THE CHEMISTRY OF SUBSURFACE WATERS IN THE WESTERN PART OF THE TURGAY TROUGH,
For primary bibliographic entry see Field 2F.
W76-10942

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
For primary bibliographic entry see Field 2F.
W76-10943

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W76-10950

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5A.
W76-11065

WATER-QUALITY INVESTIGATION, EEL RIVER, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11069

VARIATION IN CONCENTRATION OF SELECTED WATER-QUALITY CONSTITUENTS IN THE SACRAMENTO RIVER AT BEND BRIDGE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11078

U.S. GEOLOGICAL SURVEY WATER QUALITY MONITOR, OPERATIONS MANUAL,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-11080

2L. Estuaries

PERIPHYTIC AND PLANKTONIC ALGAE OF THE LOWER FRASER RIVER IN RELATION TO WATER QUALITY CONDITIONS,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10504

CHLORINATED HYDROCARBON RESIDUES IN FISHES FROM THE LOWER FRASER RIVER,
British Columbia, Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10505

A FIN ROT DISEASE OF MARINE AND EURYHALINE FISHES IN THE NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sport Fisheries Marine Lab.; and National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-10524

ANNUAL CYCLE OF SPORTFISHING ACTIVITY AT A WARMWATER DISCHARGE INTO GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
For primary bibliographic entry see Field 5G.
W76-10541

NATIONAL OCEAN POLICY: PRIORITIES FOR THE FUTURE,
Committee on Commerce (U. S. Senate). Committee on Commerce National Ocean Policy Study.
For primary bibliographic entry see Field 6E.
W76-10591

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10607

POLYCHLORINATED BIPHENYLS OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W76-10647

SOME CONSIDERATIONS ON MONITORING OF TRACE METALS IN ESTUARIES AND OCEANS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5A.
W76-10653

MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH,
IIT Electro-Physics Lab., Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W76-10671

EVALUATION OF WATER SAMPLES COLLECTED DURING LANDSAT-1 OVERPASSES OF THE LOWER CHESAPEAKE BAY AREA,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 5A.
W76-10672

DUMPING SEWAGE SLUDGE IN THE OCEAN.
For primary bibliographic entry see Field 5E.
W76-10674

HORIZONTAL RANDOM TEMPERATURE STRUCTURE OF THE OCEAN,
Naval Research Lab., Washington, D. C.
W. B. Moseley, and D. R. Del Balzo.
Journal of Physical Oceanography, Vol. 6, No. 3, p 267-280, May 1976. 15 fig, 5 tab, 27 ref.

Descriptors: *Oceans, *Temperature, *Mathematical studies, *On-site investigations, Least squares method, Correlation analysis, Buoyancy, Convection, Water temperature, Internal waves, Oceanography.

A theoretical model of the spatial spectrum of horizontally distributed thermal microstructure was developed for anisotropic turbulence. A two-term power law representation was obtained for the horizontal temperature spectrum which includes the influence of buoyancy and convective forces and which applies in a wavenumber range between internal waves and dissipation. The classical -5/3 power law due to inertial turbulence was combined with a -3 power law attributed to buoyancy forces. The spectral range was shown in perspective with the total temperature spectrum and explanations were given for the wide variety of single-term power laws measured in the field. Companion experimental data from 54 long horizontal tows at depths between 97.5 and 1454 m at two widely separated stations near Bermuda supported the predictions. Both the -5/3 and -3 predicted power laws were observed; the mean values were -1.68 and -2.94, respectively. (Sims - ISWS)
W76-10691

REPEATED PROFILING OF MICROSTRUCTURE LENSES WITH A MIDWATER FLOAT,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
G. O. Williams.
Journal of Physical Oceanography, Vol. 6, No. 3, p 281-292, May 1976. 14 fig, 1 tab, 20 ref.

Descriptors: *Oceans, *Temperature, *On-site data collections, *Pacific Ocean, On-site investigations, Instrumentation, Equipment, Surveys, Measurement, Internal waves, Oceanography.
Identifiers: *Temperature microstructure, Thermal structure.

A freely drifting, midwater float equipped with a buoyancy controller has been developed and used to obtain 20 m profiles of temperature gradient (about 0.02 m resolution) and temperature (about 0.5 m resolution) at about 6 min intervals. Thermal structure and internal wave motions from a 20 h record obtained at 550 m depth and 500 km offshore from Southern California were analyzed. Intense microstructure activity is episodic and concentrated into microstructure 'lenses.' Two of three lenses of increased microstructure activity found were associated with intrusions of about 5 m vertical and about 100 m horizontal scale. A third, much smaller and weaker lens was associated with a temperature step. A hint that microstructure intensity is modulated by low-frequency internal wave shear was also found. (Sims - ISWS)
W76-10692

BAROCLINIC INSTABILITY IN THE DENMARK STRAIT OVERFLOW,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia).
P. C. Smith.
Journal of Physical Oceanography, Vol. 6, No. 3, p 355-371, May 1976. 16 fig, 1 tab, 18 ref, 1 append.

Descriptors: *Model studies, *Overflow, *Straits, *Atlantic Ocean, Oceans, Flow, Temperature, Water temperature, Salinity, Density, Variability, On-site data collections, Current meters, On-site investigations, Circulation, Water circulation, Currents(Water), Mathematical models, Oceanography.
Identifiers: *Denmark Strait.

Current meter records and hydrographic data taken in the Denmark Strait overflow during a one-month experiment in August-September 1973 were analyzed. Mean conditions indicated that strong, cold overflow current existed throughout the experiment. The most outstanding feature of the velocity and temperature spectra was a strong peak at a period of 1.8 days. These oscillations appeared to amplify in the downstream direction and were highly correlated over the entire flow at the southern end of the Strait. Phase estimates indicated that velocity components are in quadrature, while the cross-stream perturbation heat flux acts to reduce the mean potential energy associated with the sloping isotherms. To explain the low-frequency variability, a quasi-geostrophic two-layer model for channel flow with a sloping bottom was developed. Using measured values of shear and other physical parameters, the model was found to be unstable over a limited range of wavelengths and frequencies. The most unstable wave is 80 km long and has a period of 2.1 days in close agreement with peaks in the current meter spectra. Furthermore, phase differences measured across the stream were found to be consistent with the propagation in the direction of the mean flow. The study concluded with a discussion of finite-amplitude aspects of the instabilities. (Sims - ISWS)
W76-10693

NUTRIENT TRANSPORTS THROUGH LANCASTER SOUND IN RELATION TO THE ARCTIC OCEAN'S REACTIVE SILICATE BUDGET AND THE OUTFLOW OF BERING STRAIT WATERS.
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-10717

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10741

ABUNDANCE AND BIOMASS OF ZOOPLANKTON DURING THE SYNOPTIC INVESTIGATION OF THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA (SOUTH

BALTIC) DURING MAY/JUNE, 1972. (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10817

MARINE MOLYSMOLOGY: THE PRIMARY PRODUCTION OF EXPERIMENTAL ECOSYSTEMS SET UP IN THE RANCE RIVER ESTUARY. EFFECT OF CRUDE OIL,
Marine Laboratory of General and Comparative Physiology, Paris, France.
For primary bibliographic entry see Field 5C.
W76-10830

EFFECTS OF THREE EMULSIFYING AGENTS AGAINST CRUDE OIL ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS,
Laboratoire de Physiologie des Etres Marins de l'Institut Oceanographique, Paris, France.
For primary bibliographic entry see Field 5C.
W76-10831

ENVIRONMENTAL REGULATION OF THE ANNUAL REPRODUCTIVE SEASON OF STRONGYLOCENTROTUS PURPURATUS (STIMPSON),
California Univ., Los Angeles. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10888

SURVIVAL OF HUMAN PATHOGENS IN THE MARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-10890

TRACE ELEMENT INTERACTIONS IN THE ESTUARINE ZONE OF THE ANASCO RIVER, PUERTO RICO,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W76-10892

METABOLISM OF MERCURY COMPOUNDS IN MICROORGANISMS,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W76-10894

PARTIAL DEPLETION OF SALINE GROUNDWATER BY SEEPAGE,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
J. C. Van Dam.
Journal of Hydrology, Vol. 29, No. 3/4, p 315-339, April 1976. 14 fig, 3 tab, 4 ref.

Descriptors: *Saline water intrusion, *Encroachment, *Saline water systems, *Hydrogeology, *Seepage, *Model studies, Land reclamation, Water table, Pumping, Freshwater, Recharge, Saline water, Groundwater.
Identifiers: *Netherlands, *Polders.

The geohydrologic conditions prevailing in the western part of the Netherlands, particularly the numerous so-called polders, were analyzed with respect to seepage of saline water. The polders are reclaimed lakes or parts thereof and have a land elevation of up to several meters below mean sea level. The groundwater levels in the polders are artificially controlled at depths of about 0.3 to 2 meters below land surface by means of embankments, sluices, and pumping stations. A highly schematized, one-dimensional model was developed to investigate the effects of reclamation of the deep polders. Seepage of saline water induced by reclamation of these polders was found to be of temporary nature. This temporary seepage comes from diminution of the volume of saline water present in the aquifer. The permanent seepage of saline water, currently recharged by sea water, increases with lower polder levels. The results of this model study indicated interesting tendencies, but more complicated models and study of transient effects are needed to interpret the actual field conditions. (Singh - ISWS)
W76-10920

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-10925

AN EXAMPLE OF THE MODIFICATION OF OCEAN CURRENTS BY BOTTOM TOPOGRAPHY,
New South Wales Univ., Kensington (Australia), School of Mathematics.
N. G. Barton.
Tellus, Vol. 28, No. 3, p 261-265, 1976. 3 fig, 12 ref.

Descriptors: *Model studies, *Ocean currents, *Topography, Mathematical models, Mathematics, Equations, Boundary layers, Circulation, Water circulation, Currents(Water), Oceans, Beds, Fluid mechanics, Oceanography.

A mathematical model was presented for steady currents in ocean basins which become deeper towards the poles. Relatively large currents occur in an interior layer at the line where d/(dy) (f/h) changes sign, (f is the Coriolis parameter, h the depth and y a northward co-ordinate). The flow in the interior layer was described quantitatively and the work thus complements some recent studies. (Sims-ISWS)
W76-10931

USE OF A TROPHODYNAMIC CHAIN OF THE BENTHIC TYPE FOR THE STUDY OF TRANSFERS OF METALLIC POLLUTANTS, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5C.
W76-10944

TIDE-INDUCED MASS TRANSPORT; A FLUSHING MECHANISM FOR SHALLOW LAGOONS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
J. van de Kreeke.
Journal of Hydraulic Research, Vol. 14, No. 1, p 61-67, 1976. 1 tab, 5 ref, 1 append. NSF GK-32654.

Descriptors: *Sediment transport, *Coasts, *Lagoons, *Channels, *Tides, *Florida, Flow characteristics, Stress, Hydraulics, Ocean waves, Inlets(Waterways), Equations.
Identifiers: Mass transport, Flushing mechanism.

The mass transport accompanying tidal waves was investigated as a flushing agent for coastal channels and lagoons. Along the Florida coast, many coastal channels and lagoons have an elongated shape and nearly one-dimensional flow pattern. It follows from the dynamic equation that bottom stress associated with the mass transport serves to balance the gradient of the radiation stress and the net bottom stress associated with the tidal waves. The mass transport is a function of tidal amplitude and depth. It was shown that inlets can play an important role in the mass transport and that by properly selecting the inlet dimensions, the mass transport can be considerably increased. The tide-induced mass transport was shown to be an important mechanism in renewing the waters of shallow lagoons. (Singh - ISWS)
W76-10947

A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION: THE EFFECTS OF ALTERING DEPTH AND RIVER DISCHARGE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
J. F. Festa, and D. V. Hansen.
Estuarine and Coastal Marine Science, Vol. 4, No. 3, p 309-323, May 1976. 12 fig, 14 ref.

Descriptors: *Model studies, *Estuaries, *Flow, Rivers, Streamflow, Mathematical models, Salinity, Discharge(Water), Equations, Analytical techniques, Circulation, Water circulation, Coasts, Tidal waters, Depth, Bays, Oceans, Hydrodynamics.
Identifiers: Two-dimensional models.

Steady-state numerical solutions were obtained for a two-dimensional, vertically stratified model of a partially mixed estuary. The boundary at the seaward end of the estuary was considered to be open, with the profiles of salinity, vorticity, and streamfunction obtained by extrapolating interior dynamics out to the boundary. A salinity source was maintained at the bottom at the mouth. Zero salt flux was required at a free-slip top and no-slip bottom boundary. Zero salinity and a parabolic velocity profile were maintained at the head of the estuary. A number of cases were run for various estuarine parameters, the river transport and Rayleigh number being the two parameters that have the most pronounced effect. The river transport was varied by adjusting the mean freshwater velocity, U sub f. Decreasing U sub f allows salt as well as the stagnation or null point to penetrate upstream. The estuarine circulation weakened, but expanded over a larger portion of the estuary. The position of the stagnation point, with respect to the seaward boundary, varied as U sub f to the (-5/8) power for U sub f greater than 1 cm/s and as U sub f to the (-5/6) power for U sub f less than 1 cm/s. Increasing the Rayleigh number, by deepening the estuarine channel, H, resulted in an increased circulation as well as strong intrusion of salinity and inward migration of the stagnation point. The horizontal location of the stagnation point was found to be proportional to Ra and therefore, varies as H cubed. (Sims- ISWS)
W76-10948

A MODEL FOR WATER AND PHOSPHORUS DISTRIBUTION ON THE ISLAND OF GOETEBORG, (IN SWEDISH),
Uppsala Univ. (Sweden).
For primary bibliographic entry see Field 5B.
W76-10963

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11001

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-11007

DISPERSION OF DYED SEA-WATER DISCHARGED FROM MOVING VESSELS IN COASTAL WATERS,
Dobrocky Seatech Ltd., Victoria (British Columbia).
For primary bibliographic entry see Field 5B.
W76-11086

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-11099

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FINAL REPORT, MATERIAL EVALUATION AND DEVELOPMENT PROGRAM, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 500, $7.75 in paper copy, $3.00 in microfiche. OWRT/S--76/50 May 1973. 215 p, 15 fig, 20 tab. DOI 14-30-3014.

Descriptors: *Desalination plants, *Flash distillation, Desalination apparatus, Corrosion, *Corrosion control, Treatment facilities, *Materials testing, *Measurement, Testing, Quality control, Steel, Alloys, Construction materials, Electrochemistry, Ultrasonics, Conductivity.
Identifiers: Corrosion measurement, Corrosometer, Corrator, Ultrasonic wall thickness measurement, Coupon weight loss.

Four plants at the San Diego Test Facility (SDTF) were studied for corrosion effects during 1972. The Clair Engle Plant (CEP) was the principal plant for corrosion and coatings testing. The methods of corrosion testing were ultrasonic wall thickness measurements, coupons, Corrater, and Corrosometer (these last two are electro-chemical devices). The results correlated well between the different techniques. Intensive corrosion data obtained in the CEP, Effect 1-A plant (E1A) multistage flash module (Module), and Vertical Tube Evaporator (VTEX) showed high carbon steel corrosion in all areas, particularly in the E1A and VTEX. From the results of observations and tests on materials at the SDTF, a list of recommended materials of construction for future distillation plants has been compiled.
W76-10552

FINAL REPORT, HORIZONTAL SPRAY FILM (HTEX) AND VERTICAL TUBE (VTEX) EVAPORATOR, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 501, $8.00 in paper copy, $3.00 in microfiche. OWRT/S--76/49 May 1973. 224 p, 54 fig, 21 tab, 5 append. DOI 14-30-3014.

Descriptors: *Desalination plants, Treatment facilities, *Evaporators, *Desalination apparatus, *Performance, Evaporation, *Thin films, Films, Heat transfer, Cost comparisons.
Identifiers: *Horizontal tube evaporators, *Vertical tube evaporators, *Horizontal spray films.

To investigate and verify horizontal tube evaporation (HTME) performance, construction was begun on the horizontal tube evaporator test vehicle (HTEX) at the San Diego Test Facility. The plant was designed and built by Aqua-Chem, Inc. This report summarizes the work carried out at the HTEX, since completion of the unit in October 1972. As a result of the phaseout of the San Diego Test Facility, performance testing was carried out on a 7-day, 3-shift basis to permit maximum data recovery. All performance data were obtained during the month of February 1973. HTEX operations ceased on March 2, 1973. The overall evaluation of the HTEX indicates the horizontal tube spray film process for seawater evaporation is very stable, feasible, and has a greater potential than the multistage flash distillation (MSF) process because the overall heat transfer coefficients for smooth tubes are about twice those of the MSF process and it suffers no submergence or nonequilibrium losses. The shell cost and therefore coating costs in the HTME are lower, and smaller pumps are required compared to the large recycle pumps in the MSF process. The HTME process is superior to the vertical tube multiple effect process if the premium price for the double fluted tube in the VTE is high. The HTME process still has however some problems, such as uniformly distributing the brine spray over large bundles, and uniformly distributing the vapor over the tubesheet in a large bundle.
W76-10553

WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. I. EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER,
Rouen Univ. (France). Lab. of Macromolecular Chemistry.
M. Demarty, A. Maurel, and E. Selegny.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-16648, $3.50 in paper copy, $3.00 in microfiche. March, 1975. 24 p, 5 fig, 10 tab, 24 ref. Technical Translation NASA F-16, 169. Translated from Journal de Chimie Physique, Vol. 71, No. 6, p 811-818, 1974.

Descriptors: *Analytical techniques, *Cation exchange, *Electro-osmosis, *Water chemistry, Water temperature, Capillary action, Flow, Membrane processes, Ion exchange, Desalination.
Identifiers: *Water transport number.

An automatic method for measuring electro-osmotic flows was developed, derived from the capillary technique. A photoelectric system is used to observe the change of position of the meniscus in the capillary, and an electric voltage proportional to it is provided. Extremely small flows can be measured because the movements of the fluids can be amplified about 100-fold. The method was used to measure the water transport numbers of two cation-exchange membranes while varying the concentration of the solutions, the nature of the electrolytes, and the temperature. Current density did not influence the electro-osmotic flows when the solutions flooding the surface were sufficiently agitated. The water transport number increased at low current densities when there was no agitation. There was a strong dependence between water transport number and concentration between 0.01 and one N. The nature of the ion is important; smaller ions have a weaker effect. Increasing the concentration causes a considerable penetration of salt inside the membrane, which diminishes the effective charge of the membrane. The membrane also deflates, decreasing the hydraulic permeability. Measured water transport numbers were compared with those calculated with Manning's model for sodium chloride at different concentrations. A satisfactory semiquantitative agreement between the experimental and calculated values was obtained. However, the model cannot explain the polarization effects observed while measuring the water transport number as a function of current density under natural convection. (Snyder-FIRL)
W76-10620

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10677

MATERIALS FAILURE IDENTIFICATION MANUAL FOR SEA WATER DESALINATION PLANTS.
Aqua-Chem, Inc., Milwaukee, Wis.
Oak Ridge National Laboratory, Tennessee, Report ORNL/TM-5001, April 1976. 133 p, 92 fig. OWRT-ERDA 40-224-70.

Descriptors: *Desalination plants, *Corrosion, *Corrosion control, Materials, Materials engineering, *Failures, *Failure(Mechanics), Equipment, Pitting(Corrosion), Quality control, Cavitation, Fatigue(Mechanics), *Desalination apparatus.
Identifiers: *Materials failure.

Materials failure problems are presented as they relate to specific areas of desalination systems, especially corrosion problems. Photographs show examples of both normal conditions and failures as they might exist in desalination plants. The generic types of corrosion as characterized by a metallurgist or materials expert are discussed. Some commonly accepted mechanisms and terminology are used to give insight into how classical materials treatment and study may relate to problems of desalination systems. A complete photographic comparison section, showing actual desalting plant materials in many forms and conditions, is given. A variety of artist's sketches of typical parts of desalination plants is presented. The manual is a reporting form which provides for the description of the appearance and location of the materials failure, through the use of a coding system. The manual also provides both a discussion of field problems and commonly used repair techniques. Finally, it provides a convenient, consistent communications vehicle for description and discussion of materials failure problems. (OWRT)
W76-10880

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel International Corp., San Francisco, Calif.
L. Awerbuch, and C. T. Draney.
U. S. Patent No. 3,953,972, 6 p, 2 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 42, May 4, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Thermal conductivity, Flash distillation, Multi-stage flash distillation, *Desalination, Desalination processes, Potable water, Brines, Separation techniques, Evaporators, Condensers, Heat exchangers.
Identifiers: Metal recovery.

A system and method is disclosed for utilizing the heat energy of the effluent from a geothermal well. The system includes a surface evaporator which allows a preheated distillate, freed of impurities, to be vaporized by the heat energy of the steam and/or brine from the geothermal well. The resulting vapor is used to drive a power unit such as a multi-stage turbine. The vapor exhausted from the power unit is condensed by any of a number of conventional means. A portion of the condensate is then recycled through the system, where it becomes the direct contact condensing medium for the vapor produced by flashing hot geothermal brine in a multi-stage flash evaporator through which the brine and the condensate are passing countercurrently. The vapor thus condensed augments the recycled condensate and, together, they constitute the distillate entering the surface evaporator and carrying with it the heat energy extracted from the brine in the flash evaporator. The remainder of the condensate from the condenser may be withdrawn from the system and constitutes a product resulting from the practice of the desalination process of the invention. Residual brine is carried off from the multi-stage flash evaporator and contains retrievable salts and other valuable minerals. (Sinha-OEIS)
W76-10967

3B. Water Yield Improvement

SUPERSATURATION AND TIME DEPENDENCE OF ICE NUCLEATION FROM THE VAPOR ON SINGLE CRYSTAL SUBSTRATES,
Nevada Univ., Reno. Lab. of Atmospheric Physics.
B. J. Anderson, and J. Hallett.
Journal of the Atmospheric Sciences, Vol. 33, No. 5, p 822-832, May 1976. 12 fig, 26 ref.

Descriptors: *Nucleation, *Crystals, *Silver iodide, Ice, Cloud physics, Weather modification, Supersaturation, Saturation, Laboratory tests, Equipment, Meteorology.
Identifiers: *Ice crystal nucleation, Covellite.

Nucleation of individual ice crystals on large (3.0 mm) cleaved crystals of solution-grown silver iodide and covellite was investigated by microscopy. The environmental vapor pressure was controlled by saturating two air streams by passage through ice labyrinths at different temperatures and mixing them in known proportion. This enabled the vapor pressure to be changed over a period of about 10 s. Ice crystals do not usually appear immediately when a supersaturation is imposed. Nucleation, defined as the appearance of crystals of 1 micrometer radius, is delayed between zero and 70 s near water saturation and between 20 and 400 s at a few percent ice supersaturation, the longer times occurring at higher temperature. This time decreases only marginally when the crystal is exposed to a period of higher supersaturation which ends a few seconds prior to the time crystals would appear at this higher value. The number of crystals per unit area increases with ice supersaturation at a given temperature; for CuS at -16 C, it increases by a factor of 3 between 3% and water saturation. Number concentrations on silver iodide are comparable, but increase with time when the surface is exposed to light. Results were applied to crystal nucleation in the atmosphere and the characterization of ice nuclei in laboratory instruments. (Sims - ISWS)
W76-10695

HETEROGENEOUS ICE NUCLEATION IN THE PRESENCE OF ALIPHATIC AMINES AND AMMONIA,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
R. Schnell, and G. Vali.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-009 959, $4.00 in paper copy, $3.00 in microfiche. Report No. AS113, December 1974. 28 p, 8 fig, 2 tab, 21 ref. ONR N00123-72-C-0911.

Descriptors: *Weather modification, *Chemistry of precipitation, *Nitrogen compounds, *Nucleation, *Cloud seeding, *Inhibitors, Climatology, Meteorology, Rainfall, Weather, Air temperature, Clouds, Ice, Condensation, *Ammonia, Cloud physics, Precipitation(Atmospheric) Crystals, Laboratory tests, On-site investigations, *Wyoming.
Identifiers: *Ice crystal formation, *Nucleating inhibitors, Aliphatic amines, Elk Mountain(Wyo), Artificial nuclei, *Amines, Methylamine, Ethylmine, Propylamine.

There is fairly extensive evidence, mostly from laboratory experiments, that certain vapors can significantly reduce the nucleating abilities of varieties of nucleating materials. The work described in this report was undertaken to expand the background knowledge about such inhibiting processes and to explore the possibilities of applying inhibitors to natural clouds. Three major experimental approaches were employed: (1) the freezing of water droplets containing known amounts of nucleants ('freezing nuclie') and additives, (2) the activation of 'deposition nuclei' in a static diffusion chamber, and (3) field tests. Based on the work reported in this paper and on re-analysis of similar earlier work, it was concluded that the inherent nucleating abilities of most materials are affected to only small extents by exposures to aliphatic amine gases or to ammonia. It thus appears that there are no strong interactions of these gases with the types of nucleating materials tested. In the case of nuclei suspended in liquid water, large apparent changes can occur due to depressions of the equilibrium melting point of the water by dissolution of the gases. (Henley - ISWS)
W76-10716

ANTITRANSPIRANT SPRAYS AFFECTING FRUIT SIZE OF EARLY AMBER PEACHES,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 3F.
W76-10725

TEXT AND COMMENTARY FOR WEATHER MODIFICATION CONTROL LAW,
Arizona Univ., Tucson. Coll. of Law.
R. J. Davis.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 717, $4.00 in paper copy, $3.00 in microfiche. OWRT A-064-ARIZ(2) 14-34-0001-6003. Completion Report, June 1976. 43 p, 31 ref.

Descriptors: Environment, *Legislation, Water rights, *Weather modification, *Arizona, Regulation, Water law.
Identifiers: Liabilities.

The weather modification control law was prepared as (1) a substitute for the present weather control chapter of the Arizona Water Code, and (2) a suggested state law which could be used to improve weather control laws of other jurisdictions. Sections of the text of the proposal are accompanied by commentary on opposite pages explaining their effects. Review of weather modification developments and legal regulations indicated that the three key provisions of successful weather control laws require: (1) professional licenses of weather modifiers, (2) operational permits for projects, and (3) record keeping and reporting by licensees operating projects. Statutes also contain general, administrative, and judicial provisions. A tentative draft of the statue and commentary was prepared incorporating these provisions and explaining them. The draft was circulated for comment by experts in weather modification, water resources management, water law, and the political processes. Responses were considered during preparation of the final draft which is contained in this report. It has been presented to interest groups, circulated among weather control agencies, and considered by legislatures.
W76-10809

WSSI FINAL REPORT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Western Scientific Services, Inc., Fort Collins, Colo.
C. L. Hartzell, and L. W. Crow.
Report FR-359-46, March 1976, to Bureau of Reclamation, Denver, Colorado, Div. of Atmospheric Water Resources Management. 235 p, 45 fig, 27 tab, 23 ref, 3 append. 14-06-D-6644.

Descriptors: *Colorado River Basin, *Weather modification, Meteorological data, Networks, *Data processing, Data collections, Meteorology, Cloud seeding, *Data collections.
Identifiers: San Juan Mountains(Colo).

The data collection project of the Colorado River Basin Pilot Project had as its major objective the design, installation, and operation of a hydrometeorological instrument and observation network which would subsequently furnish detailed records, both in time and space, from which the effects of winter orographic cloud seeding operations could be evaluated. This data collection project was conducted over the six year period 1969-1975. Sufficient personnel and equipment were committed to the project assignment in order to show hourly, three-hourly, and daily comparisons of precipitation amounts received at the network of sampling stations. Physical measurements of air temperature, wind speed and direction, ice nucleus concentrations, and snow crystal characteristics helped document the meteorological conditions which were coincident with the precipitation processes within each winter season. The data sets collected each year were processed using routine procedures and were carefully screened for accuracy. These finalized data sets are of high quality and can be confidently used for analysis purposes. (Bureau of Reclamation)
W76-10818

SOUTH DAKOTA WEATHER MODIFICATION PROGRAM, RESEARCH COOPERATIVE STUDIES UNDER PROJECT SKYWATER,
South Dakota Dept. of Natural Resources Development, Pierre. Div. of Weather Modification.
J. A. Donnan, J. L. Pellett, and R. S. Leblang.
Final Report, DWM Report-76-3, to Bureau of Reclamation, Denver, Colorado, Division of Atmospheric Water Resources Management, June 1976. 200 p, 3 ref, 9 append. 14-06-D-7240.

Descriptors: Climatic data, Clouds, Cloud seeding, Hail, Meteorology, Ice nuclei, Precipitation(Atmospheric), Rainfall, Silver iodide, *South Dakota, Statistics, *Weather modification.
Identifiers: Cumulus clouds.

An analysis of gridded monthly rainfall data indicates that South Dakota seeded counties received, overall, 6.7% more rainfall during the four program seasons than would be expected on the basis of unseeded county rainfall. The Bureau of Reclamation Environmental Network provided useful and timely input to the seeding decision process. A simple program was developed to reduce the forecaster's time in the interactive mode with the computer. A 'Decision Ladder' was developed and found to be useful in streamlining the transfer of weather modification technology to program operations. The Colorado State University Statistics Department used the principal components technique to identify and combine related stations' precipitation time series into a less variable series. A time series model was found to fit the observed precipitation series reasonably well and with good regularity. North American Weather Consultants found serial rawinsonde data useful in identifying subtle mechanisms governing nocturnal thunderstorm activity. The dominant mechanisms seem to be fields of vertical motion and thermal advection associated with a diurnally oscillating circulation between the plains and the Rocky Mountains. (Bureau of Reclamation)
W76-10819

PROCEEDINGS FROM A WORKSHOP ON INADVERTENT WEATHER MODIFICATION.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 158, $9.75 in paper copy, $3.00 in microfiche. Proceedings of a workshop held August 13-31, 1973, Utah State University, Logan, August 1973. 320 p. Wooldridge, G. L., and Peterson, D. F., editors. NSF-RA-E-73-188. NSF GI 38505.

Descriptors: *Weather modification, *Air pollution, *Cloud physics, *Aerosols, Nucleation, Measurement, Sampling, Weather, Legal aspects, Pollutants, Path of pollutants, Dispersion, Industries, Agriculture, Cities, Powerplants, Instrumentation, Cooling towers, Rainfall, Precipitation(Atmospheric), Atmosphere, Winds, Meteorology.
Identifiers: *Inadvertent weather modification.

For several years a group of meteorologists and engineers have been concerned about improving

the planning and design process in order to reduce side effects of development on weather and climate. Reported here are the results of a first workshop on inadvertent weather modification. Three groups participated: scientists having the latest relevant scientific information; professionals performing at the planning, design, and analytical level; and executives having responsibility for decisions in industry and government. Papers discussed the effects of agriculture, industry, powerplants, and urban areas on clouds, precipitation, and other weather parameters. The dispersion and movement of pollutants were also discussed. Sources and fates of aerosols in the atmosphere were described. One paper on the legal requirements for the assessment of inadvertent weather modification stressed the problems of preparing environmental impact statements and related documents. (See W76-10902 thru W76-10913) (Sims-ISWS)
W76-10901

THE INADVERTENT IMPACTS OF AGRICULTURE ON WEATHER AND CLIMATE AND AGRICULTURAL METHODS FOR AMELIORATION OF CLIMATIC STRESS,
Nebraska Univ., Lincoln. Dept. of Agricultural Climatology.
N. J. Rosenberg.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 5-32. 7 fig, 3 tab, 41 ref.

Descriptors: *Agriculture, *Weather, *Weather modification, Climates, Radiation, Solar radiation, Albedo, Crops, Rainfall, Precipitation(Atmospheric), Evaporation, Evapotranspiration, Evapotranspiration control, Turbidity, Water vapor, Carbon dioxide, Irrigation, Farm management, Winds, Windbreaks, Meteorology.
Identifiers: Inadvertent weather modification.

Agriculture modifies the environment and is affected by it. Perhaps there is no other industry or endeavor so closely linked and dependent on the vagaries of weather and climate as is agriculture. The land which is manipulated in agricultural operations and the condition of the world's forested lands have great impact on the environment. Agriculturalists and horticulturalists, probably from primitive times, have attempted to find ways to protect their plantings from the hazards of the natural environment. Soil manipulation offers one good way to alter microclimate. Irrigation is another fairly obvious method of modifying the environment. Protection from excessively strong winds offers yet another means of beneficially modifying microclimate. Other methods for water use efficiency improvement have been proposed and subjected to some critical theoretical and field testing. These include both antitransparent and reflectant materials which are intended to reduce evapotranspiration, but which work in very different ways. Another method, that of C02 enrichment or 'fertilization' of the air is intended to directly increase the rate of photosynthesis. (See also W76-10901) (Sims-ISWS)
W76-10902

ATMOSPHERIC EFFECTS OF POLLUTANTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10903

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10904

URBAN-INDUSTRIAL EFFECTS ON CLOUDS AND PRECIPITATION,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4C.
W76-10905

SOME CHARACTERISTICS OF A DUSTY RAIN IN YUGOSLAVIA,
Yugoslavic Academy of Science and Arts, Zagreb. Inst. for Physics of the Atmosphere.
For primary bibliographic entry see Field 5A.
W76-10906

DISPERSION OF POLLUTANTS,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5B.
W76-10907

WIND-TUNNEL SIMULATION OF ATMOSPHERIC FLOW AND DISPERSION,
Colorado State Univ., Fort Collins. Fluid Mechanics Program.
For primary bibliographic entry see Field 5A.
W76-10908

INADVERTENT EFFECTS IN WEATHER MODIFICATION,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
V. J. Schaefer.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 227-235. 1 tab, 14 ref.

Descriptors: *Nucleation, *Lead, *Clouds, *Fog, Laboratory tests, On-site investigations, Air pollution, Path of pollutants, Pollutants, Weather, Cloud physics, Weather modification, Crystals, Ice, Particle size, Measurement, Sampling, Meteorology.
Identifiers: *Inadvertent weather modification.

Observations of particles of lead in the atmosphere were reported. It was shown that these particles react with iodine vapor to produce an effective ice nucleus. These lead particles were found to be derived from automobile exhaust. Numbers of particles were much less in locations where automobiles are not present, such as aboard ships at sea. The reaction of the lead particles with iodine provides a method of detecting these submicroscopic particles of lead which is very sensitive. The effects of these lead particles on clouds and fogs were observed. (See also W76-10901) (Sims-ISWS)
W76-10909

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 5A.
W76-10910

INTRODUCTION TO THE ATMOSPHERIC AEROSOL SYSTEM,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 5A.
W76-10911

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
H. B. Visscher.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 289-306. 8 fig, 1 ref.

Descriptors: *Weather modification, *Legal aspects, *Air pollution, Governments, Pollutants, Environment, Legislation, Economics, Benefits, Environmental effects, Cost-benefit ratio, Atmosphere, Meteorology.
Identifiers: Inadvertent weather modification, *Environmental impact statements.

Federal and state legislation has defined the requirement for assessment of, and responsibility for, actions by government or by industry which have potential for inadvertent weather modification. These assessments are part of the overall requirement for the evaluation of the environmental impact of contemplated actions. The legislative mandates have been stated in broad terms which cover the full scope of potential modifications, from the local effects to general effects on weather and climate. The content of the regulations and the philosophy of the agencies which implement this legislation have limited the current scope of the assessment to effects on health of humans and other life, and to effects on local weather. The regulatory process which has been established includes, however, the potential for the full scope of assessment of actions which may affect weather and climate. A review of the current environmental assessments being made shows that the definition of the human environment being applied in the regulatory process is much narrower than that intended by the authors of the federal legislation. (See also W76-10901) (Sims - ISWS)
W76-10912

URBAN AEROSOLS AND INADVERTENT WEATHER MODIFICATION,
Rockwell International, Thousand Oaks, Calif. Science Center.
For primary bibliographic entry see Field 4C.
W76-10913

POSSIBLE URBAN EFFECTS ON MAXIMUM DAILY RAINFALL AT PARIS, ST. LOUIS AND CHICAGO,
Meteorologie Nationale, Paris (France).
For primary bibliographic entry see Field 4C.
W76-10929

METHOD OF MAKING SNOW,
H. K. Dupre.
U. S. Patent No. 3,952,949, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1728, April 27, 1976.

Descriptors: *Patents, *Snow, *Crystals, *Skiing, Snow cover, Temperature, Freezing, Sprays.
Identifiers: Artificial snow, Compressed air.

Artificial snow is formed from seed crystals. These seed crystals are formed from the expansion of air expelled into the atmosphere around which minute water particles freeze and form snow. The air, being compressed, is at a higher temperature than normal ambient winter conditions and when expelled will expand to atmospheric pressure while reducing a great deal in temperature. Because of the pressure reduction, the high level of moisture present in the compressed air upon expansion will condense, immediately forming the seed crystals necessary for snow. These seed crystals are immediately formed because of the extremely low temperature condition obtained through the expansion of the air together with freezing atmospheric conditions of winter, that is, temperatures below 32 deg F. The seed crystal thus formed can be combined with atomized water in a manner to form more snow. In this invention a compressed air nozzle adjacent and above a water atomizing nozzle at the top of a snow tower is provided. The optimum area of snow coverage is ob-

tained as well as maximum dwell time in which the seed crystals and tiny atomized water particles may completely commingle and unite to form snow prior to reaching the ground. The compressed air upon expanding shreds the atomized water particles from the spray nozzle into finer water particles; implants seed crystals in the atomized water spray or fog; and cools the entire discharge zone to an extremely cold condition highly desirable for snow making. (Sinha-OEIS)
W76-10958

3D. Conservation In Domestic and Municipal Use

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
For primary bibliographic entry see Field 5G.
W76-10508

SAMPLING TECHNIQUES IN URBAN RUNOFF QUALITY STUDIES,
Canada Centre for Inland Waters, Burlington, Ontario, Hydraulic Div.
For primary bibliographic entry see Field 5A.
W76-10509

ENVIRONMENTAL INVESTIGATION OF EDEN ISLES,
Burk and Associates, Inc. (New Orleans).
For primary bibliographic entry see Field 5G.
W76-10510

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10568

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL 1),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10605

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-10608

CITIES NEED SEWERLESS TOILETS,
Institute for Local Self-Reliance, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10680

WATER SUPPLY FOR THE GREATER NEW YORK METROPOLITAN AREA,
Corps of Engineers, New York. Northeastern U.S. Water Supply Study.
For primary bibliographic entry see Field 6B.
W76-10983

3E. Conservation In Industry

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, METAL FINISHING INDUSTRY,
Lancy Labs., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W76-10555

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, METAL FINISHING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10556

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRON AND STEEL INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10557

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, IRON AND STEEL INDUSTRY,
McKee (Arthur G.) and Co., Cleveland, Ohio.
For primary bibliographic entry see Field 5D.
W76-10558

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PULP AND PAPER INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10559

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PETROLEUM REFINING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10560

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, LEATHER TANNING INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10561

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FERTILIZER INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10562

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PLANT CLOSURES.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10563

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, NON-FERROUS METALS INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10565

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, TEXTILE INDUSTRY.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10566

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTEWATER TREATMENT IN CHLORINE CAUSTIC PRODUCTION,
Houston Univ., Tex.
For primary bibliographic entry see Field 5D.
W76-10621

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-10676

A FEASIBILITY STUDY OF THE CONTROL OF POLLUTION FROM INDUSTRIAL WASTE WATERS DISCHARGED INTO THE LAGOON OF VENICE,
Bostock, Hill and Rigby. Birmingham, (England).
For primary bibliographic entry see Field 5D.
W76-10679

COAL MINING, DEVELOPMENT AND PROCESSING -- THE ASSOCIATED WATER PROBLEMS,
Clyde and Pratt, Salt Lake City, Utah.
For primary bibliographic entry see Field 6E.
W76-10727

CHARACTERIZATION AND TREATMENT OF BRINE WASTEWATERS FROM THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ., at Chapel Hill. School of Public Health.
L. W. Little, J. C. Lamb, III, and L. F. Horney.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 720, $6.00 in paper copy, $3.00 in microfiche. North Carolina Water Resources Research Institute, Raleight, UNC-WRRI Report No. 99, May 1976. 125 p, 11 figs, 59 tab, 43 ref, 2 append. OWRT A-079-NC(2) 14-31-0001-4033.

Descriptors: *Food processing industry, *Brines, *Brine disposal, *Industrial wastes, *Canneries, Salinity, Water reuse, Fermentation, *Waste water treatment, Recirculated water, Foods, North Carolina, Industrial waste, *Waste identification, Surveys, Recycling.
Identifiers: *Cucumber pickling industry, *Pickle processing ultrafiltration procedure, pH coagulation-precipitation procedure, Ultrafiltration.

Industrial water and wastes surveys were conducted at two pickle companies. Water usage and waste characteristics were determined on major unit operations, including tankyard brining, desalting and processing, slicing and cutting operations, and pasteurization. Laboratory and pilot scale studies were performed to evaluate potential for recycling concentrated tankyard brines. Both a high pH coagulation-precipitation procedure and an ultrafiltration procedure were investigated. A 'desk-top' evaluation of various brine treatment processes compared their cost-effectiveness. The study indicated that in-plant water and salt usage could be substantially reduced by closer management and better housekeeping; that tankyard brines could be treated and reused at least once with no sacrifice of product quality; and the existing wastewater treatment facilities (aerated lagoons) could be upgraded to improve BOD and solids removal. Additionally, the results of the study provide a detailed characterization of the types and concentration of components of waste

streams from unit operations in cucumber pickle production. (StewardiNorth Carolina State)
W76-10805

A CLEAN PIECE OF PAPER,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W76-10842

PRODUCTION STUDIES ON THE ELECTROLYTIC METHOD OF RECOVERING ZINC FROM EFFLUENT SEDIMENTS (PROIZVODSTVENNYE ISSLEDOVANIYA ELEKTROLITICHESKOGO SPOSOBA REGENERATSII TSINKA IZ OSADKOV STOCHNYKH VOD),
Ukrainskii Institut Inzhenerov Vodnogo Khozaistva (USSR).
For primary bibliographic entry see Field 5D.
W76-10846

USE OF ELECTRODIALYSIS IN THE WATER RECYCLING SYSTEM OF VISCOSE PRODUCTION (PRIMENENIE ELEKTRODIALIZA V SISTEME VODOOBOROTA VISKOZNOGO PROIZODSTVA),
Cherkasskii Zavod Khimicheskogo Volokna (USSR).
For primary bibliographic entry see Field 5D.
W76-10848

POLLUTION CONTROL THROUGH UTILIZATION OF SPENT SULFITE LIQUORS FROM THE PULP INDUSTRY AS ORGANIC NITROGEN FERTILIZER (EIN BEITRAG ZUR UMWELTFREUNDLICHEN TECHNIK DURCH VERWERTUNG DER SULFITABLAUGEN DER ZELLSTOFFINDUSTRIE ALS ORGANISCHER STICKSTOFFDUENGER),
For primary bibliographic entry see Field 5D.
W76-10851

TOUGH ILLINOIS EFFLUENT STANDARDS ARE MET BY CELOTEX BOXBOARD MILL,
For primary bibliographic entry see Field 5G.
W76-10856

EFFLUENTS FROM CHLORINATION AND ALKALINE EXTRACTION OF PINE SULFATE PULP,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5B.
W76-10858

NEW BOILER WATER CHEMICAL TREATMENT REDUCES CORROSION AND SCALE BUILDUP.
Paper Trade Journal, Vol. 160, No. 7, p 30-32, April 1, 1976. 5 fig.

Descriptors: *Boiler feed water, *Pre-treatment(Water), Scaling, Corrosion, Pulp and paper industry, Fuels, Costs, Boilers, Heat transfer, Surfaces, Water quality control, Water softening, Industrial water, *Corrosion control.

When a New England magazine paper mill switched from a chelant-residual program to SCA (Scale Control Agent developed by Nalco Chemical Company) in its low-pressure boilers approximately two years ago, the blowdown reduction saved $25,000 a year in fuel costs. The SCA contains chelant chemicals (not specified) but at much lower concentrations than conventional chelant treatments. At these low concentrations, corrosion is minimized. In addition, the SCA provides a metal-conditioning action that causes heat transfer surfaces to resist scale deposition. Case histories of two other mills are presented, showing other benefits from the chemical treatment. (Witt-IPC)
W76-10859

SEQUENTIAL CHLORINATION -- IMPACT ON THE ENVIRONMENT,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
For primary bibliographic entry see Field 5D.
W76-10860

ENVIRONMENTAL AND SOCIAL FACTORS (IN THE PAPER INDUSTRY),
Crown Zellerbach Corporation, Camas, Wash.
For primary bibliographic entry see Field 5G.
W76-10861

HOW TO MEET WATER CLEANUP DEADLINES,
Ecodyne Corp., Union, N. J.
For primary bibliographic entry see Field 5D.
W76-10862

UNIQUE PROCESS FOR SULFITE SPENT LIQUOR KEEPS OLDER MILL VIABLE,
For primary bibliographic entry see Field 5D.
W76-10871

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10878

3F. Conservation In Agriculture

EFFECT OF SOIL-INCORPORATED DAIRY CATTLE MANURE ON RUNOFF WATER QUALITY AND SOIL PROPERTIES,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 5B.
W76-10539

FARM ANIMAL MANURES: AN OVERVIEW OF THEIR ROLE IN THE AGRICULTURAL ENVIRONMENT,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-10548

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10567

WATER TO THE FIELDS: INDIA'S CHANGING STRATEGY,
Sussex Univ., Brighton (England). Inst. of Development Studies.
R. Wade.
South Asian Review, Vol. 8, No. 4, p. 301-321, 1975. 26 ref.

Descriptors: *Agriculture, *Asia, *Water policy, *Irrigation programs, *Land development, *Institutions, Cooperatives, Water users, Administration, Rotations, Water management(Applied), Water allocation(Policy), Irrigation canals, Adoption of practices, Psychological aspects, Equity, Political constrainsts.
Identifiers: *India, Rotational irrigation.

The institutional structures that are required to meet India's present and future agricultural requirements are discussed, particularly under the Command Area Development Program (CAD). This program is directed primarily at land development at the farm and canal outlet level where the potential for improvement is greatest. Under the CAD, the responsibility for administration of irrigation, agriculture, cooperation, soil conservation, and revenue, within a command area are transferred to a Command Area Development Authority (CAA). Some 32 CAAs have been established and represent a new step in central agricultural administration in India. The problem facing the government is to find methods of land development which will improve efficient water use, increase crop yields, lower production costs, and maintain land fertility, and be replicable on a large scale. Approaches used involve redrawing field boundaries and reallocation of land to farmers in contour terraces; other innovations are rotational irrigation and the formation of local associations that are expected to oversee water distribution, help resolve disputes, collect water rates, and be responsible for the maintenance of water courses and drains. However the resistance to and lack of success of these schemes suggest the need for socio-economic research on canals and canal irrigated agriculture, and institutional studies. (Auen-Wisconsin).
W76-10589

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W76-10612

MANURE AND THE NITRATE PROBLEM,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5E.
W76-10616

AGRICULTURAL SEDIMENT CONTROL FOR WATER QUALITY PROTECTION,
Environmental Protection Agency Washington, D. C. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W76-10617

PLANT MEASUREMENTS AS INDICATORS OF CROP WATER DEFICIT,
Southwestern Great Plains Research Center Bushland, Tex.
R. N. Clark, and E. A. Hiller.
Crop Sci. 13(4); p 466-469, 1973.

Descriptors: *Water loss, *Peas, *Lysimeters, Soil water, Indicators, Measurement, Leaves, Infrared radiation, Tensimeters, Crops, Plant physiology.

An irrigation experiment was conducted with southern peas (Vigna sinensis L. (Endl.) cv. 'Burgundy') utilizing lysimeters in which the soil water balance could be controlled. The purpose of the experiment was to compare certain plant measurements as indicators of crop water deficit. Plant measurements made on stressed and non-stressed plants throughout the growing season were leaf-water potential, leaf-air temperature differential and leaf-diffusion resistance. Leaf-water potentials were measured by the pressure chamber method on well-exposed leaves. Leaf temperatures were measured by IR radiometry and a diffusion porometer was used to measure leaf-diffusion resistance. Tensiometers were used to determine the soil-water potential and to time the irrigations. The plant response data taken throughout a day were sensitive to water deficits during the late vegetative stage; however, the measurements were less responsive when the leaves aged, indicated by plants in the pod development stage. The change was particularly evident in the leaf-

water potential measurements. All 3 plant measurements did indicate water deficit to some degree. Leaf-diffusion resistance was the least responsive, and leaf-water potential was the most responsive. Results relating leaf-water potential to leaf-diffusion resistance and soil-water potential are also given.--Copyright 1974, Biological Abstracts, Inc.
W76-10622

ANTITRANSPIRANT SPRAYS AFFECTING FRUIT SIZE OF EARLY AMBER PEACHES,
Agricultural Research and Education Center, Lake Alfred, Fla.
C. R. Barmore, D. W. Buchanan, and L. G. Albrigo.
Proc Fla State Hortic Soc. 85, p 316-319, 1972.

Descriptors: *Peaches, Fruit crops, *Antitranspirants, Sprays, Crop production, Plant growth, Color, Preservation.
Identifiers: Vapor Gard.

Application of an antitranspirant, Vapor Gard, at 0.5% to 'Early Amber' peaches 4 and 5 wk prior to commercial maturity increased fruit size. Vapor Gard increased the proportion of fruit 1-7/8 in. or larger in diameter by 18%. Fruit size was not affected until the end of the final fruit swell period. Data are given on the effects of Vapor Gard on color and shelf-life.--Copyright 1974, Biological Abstracts, Inc.
W76-10725

PEACH IRRIGATION IN FLORIDA,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
D. S. Harrison, and D. W. Buchanan.
Proc Fla State Hortic Soc. 85; p 313-316, 1972.

Descriptors: *Irrigation, *Florida, *Peaches, Fruit crops, *Sprinkler irrigation, *Supplemental irrigation.

There are about 6000 acres of peach and nectarine groves in the central and northern portions of Florida. Supplemental irrigation is necessary in these soils of low-medium water holding capacity. Types of irrigation systems considered best suited for peach production are permanent overhead sprinkler, permanent pop-up under-tree sprinkler, self propelled (traveling) gun and drip or trickle irrigation.--Copyright Biological Abstracts, Inc., 1974.
W76-10749

THE EFFECT OF CHANGING INPUT AND-PRODUCT PRICES ON THE DEMAND FOR IRRIGATION WATER IN TEXAS,
Texas A and M. Univ., College Station. Water Resources Inst.
R. D. Lacewell, and G. D. Condra.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 731, $4.00 in paper copy, $3.00 in microfiche. OWRT A-033-TEX(2) 14-31-0001-5044 14-34-0001-6045. Technical Report No. 75, June 1976. 33 p, 2 tab, 5 fig, 16 ref.

Descriptors: *Farm prices, Natural gas, Nitrogen, Irrigation, *Linear programming, Economics, Water demand, Texas, Energy, Agriculture, *Irrigation water, *Prices, Model studies, Crop production.
Identifiers: *Texas High Plains, Ogallala aquifer, Diesel.

Several studies were done on the Texas High Plains relative to the effect of increasing input prices (natural gas, diesel, and nitrogen) on irrigated agriculture, given alternative crop prices. A linear programming model was developed and applied. The results indicate use of diesel is not very sensitive to price up to about $1.38 per gallon while nitrogen use is very sensitive to price changes. The research emphasized natural gas price increases and suggest fairly significant irrigated agricultural changes begin to occur at a natural gas price of just over $2.00 mfc. Irrigated acres begin to decline, production declines and farmer net returns decline. This carries serious implications for economic viability of the average farm firm in the region.
W76-10810

PREDICTING CONSUMPTIVE USE WITH CLIMATOLOGICAL DATA,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W76-10873

IRRIGATION EFFICIENCY IN THE PRODUCTION OF CALIFORNIA CROP CALORIES AND PROTEINS,
California Univ., Los Angeles. School of Public Health.
E. L. Rada, and R. J. Berquist.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 793, $5.00 in paper copy, $3.00 in microfiche. Completion Report, Contribution No. 158, May 1976. 90 p, 12 fig, 21 tab, 27 ref, 7 append. (California Water Resources Center, Davis, Project UCAL-WRC-W-389). OWRT A-050-Cal(2).

Descriptors: *Foods, *Energy, Food abundance, Water conservation, Conservation, *California, Costs, *Crop production, Nutrients, *Proteins, *Nutrient requirements, *Irrigation efficiency.
Identifiers: *Calories, Agricultural efficiency.

An examination was made of California irrigated food production and agricultural efficiency in terms of nutrition. More than half of the state's calories and proteins come from feed crops. Field crops and small grains produced an additional 20 percent and 15 percent, respectively, of the state's totals. Alfalfa was the largest single producer of calories and proteins. Grains were the most water-efficient calorie producers, while field crops were the most water-efficient protein producers. Fruits and nuts were least efficient in both calorie and protein production per acre-foot. Ensilage was the single most efficient crop in calories (5162 megacalories per acre-foot). Alfalfa was the most productive in proteins (130 kilograms per acre-foot). Irrigated pasture was relatively inefficient per acre-foot of water applied. Among human foods, potatoes were the most efficient at 3178 megacalories per acre-foot, and tomatoes were the most efficient in protein production at 120 kilograms per acre-foot. Other calorie/protein efficient crops were wheat, barley and dry beans. Notably low efficiency crops were rice, grapes, tree fruits, lettuce, melons, and citrus. The total energy efficiency in 1972 for California agriculture was estimated at 0.86, suggesting that agriculture used more energy than it produced.
W76-10875

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-10879

THE INADVERTENT IMPACTS OF AGRICULTURE ON WEATHER AND CLIMATE AND AGRICULTURAL METHODS FOR AMELIORATION OF CLIMATIC STRESS,
Nebraska Univ., Lincoln. Dept. of Agricultural Climatology.
For primary bibliographic entry see Field 3B.
W76-10902

FIELD AND LABORATORY EVALUATION OF BI-LEVEL DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W76-10934

IRRIGATION SYSTEMS AUTOMATION,
R. E. Shettel.
U. S. Patent No. 3,952,522, 6 p, 21 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1482, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, *Surface irrigation, *Flood irrigation, Irrigation practices, *Irrigation efficiency, Irrigation ditches, Automation, Remote control.

The invention relates to gravity irrigation systems and the common diversion technique of checking waters for their distribution over farm and ranch lands. The ditch or channel is obstructed to force water up and out the ditch bank by take out openings or notches, with a balancing procedure effecting a measured flow. The object is to make water regulation selective and known and to progressively innovate a developing irrigation system into the complete automation that will employ centralized master programming and cycling. A check means is placed in the ditch. It has a metering valve for regulation and distribution of waters to produce selective and known volumes of water. The check means incorporates a movable lower panel with an upper stationary dam portion with a spillway elevating a mounting base for the location of controls. The lower panel can be manipulated to provide for controlled release of accumulated water. (Sinha-OEIS)
W76-10955

BRAKE MEANS FOR AN AIR-POWERED SPRINKLER SYSTEM,
L. R. Townsend.
U. S. Patent No. 3,952,952, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1729, April 27, 1976. Also as: U. S. Patent No. 3,952,768, 5 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1665, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Towers, Pipes, Water control, Wind.
Identifiers: Brakes, Air-powered sprinkler systems.

Air-powered sprinkler systems are employed to irrigate large areas of land around a center pivot. Drive towers are provided along the length of the overhead water supply pipe to propel the supply pipe around the center pivot. A problem arises in that the towers tend to roll down steep inclines becoming out of alignment with the other towers. Frequently, wind will also undesirably move the water supply pipe and drive towers. A principal object of the invention is to provide a brake. A control is provided on each of the towers for selectively operating the drive to maintain the pipe and towers in an aligned condition as the water supply pipe is pivoted around the central point. The control is a rotary cam plate having an alignment rod which extends to the gimbal ring on a flexible joint on the water supply pipe adjacent the tower. The rotary cam plate controls the operation of a hydraulic cylinder which is connected to a trojan bar mounted on the drive tower for reciprocating movement. The trojan bar is provided with extending dogs on its opposite ends which engage the drive wheels to rotate the same on actuation of the hydraulic cylinder. A brake is mounted on the drive tower and is urged into engagement with the inside of the drive wheel rim by a spring to prevent undesirable rotation of the drive wheel. An air cylinder is connected to the brake shoe to move

the brake shoe out of frictional engagement with the drive wheel rim as the trojan bar is driving the drive wheels. (Sinha-OEIS)
W76-10956

ALIGNMENT CONTROL APPARATUS FOR CENTER PIVOT IRRIGATION EQUIPMENT,
Frontier Machinery Co., Walla Walla, Wash. (Assignee).
E. K. Ott.
U. S. Patent No. 3,952,769, 5 p, 12 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1665, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Distribution systems, Irrigation practices, Irrigation efficiency, Pipes, Surface irrigation, Application equipment, Irrigation operation and maintenance.
Identifiers: Alignment.

The invention relates to alignment control systems for self-propelled irrigation equipment. An alignment control apparatus is described for maintaining the pipe sections of center pivot irrigation equipment in substantial linear alignment. The apparatus includes a proximity switch mounted in a water-sealable enclosure adjacent on wall and an exterior proximity element mounted on a level for movement in response to the articulation of the joint interconnecting adjacent pipe sections. The proximity switch when operated energizes a solid state contactor which in turn energizes an electrical drive motor to propel a pipe section. (Sinha - OEIS)
W76-10957

AUTOMATIC WATER SPRINKLER FOR IRREGULAR AREAS,
R. E. Taylor.
U. S. Patent No. 3,952,954, 5 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1730, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Flow control, Water distribution(Applied), Water control, Automation, Application equipment.

An automatic sprinkler apparatus for watering irregular areas is comprised of a programmer, speed control means, a nozzle arranged to rotate about a base while the angle of elevation of the nozzle, or the trajectory of the water spray, can be adjusted to control the radial distance the water travels. The sensor is arranged to adjust the speed control and the angle of the water leaving the nozzle so that time and distance of any finite area subjected to water flowing from the apparatus is maintained constant by the device. In one embodiment of the invention, the speed control is in the form of a hydraulic brake having a closed loop bypass system. Another embodiment discloses a water driven motor having a flow control valve. Either expedient provides the system with a speed control means. The programmer has a sensor device for manipulating both the speed control and a nozzle in a manner whereby the speed of rotation of the nozzle about the support base, as well as the angle of elevation of the water leaving the nozzle, is controlled to uniformly distribute water over an irregular pattern. (Sinha-OEIS)
W76-10959

YIELD AND REMOVAL OF NUTRIENTS BY OAT PLANTS DEPENDING ON FERTILIZER RATES AND SOIL MOISTURE CONTENT, (IN BELORUSSIAN),
I. I. Byerstaw.
Vyestsi Akad Navuk BSSR Syer Syel' Skahaspad Navuk 1, p 24-30. 1975.

Descriptors: *Soil moisture, *Nutrients, *Oats, *Fertilizers, Fertilization, Application rates, *Crop production.

In pot experiments with oats, the effectiveness of increased mineral fertilizer rates increased with an increase of soil moisture. Different conditions of providing the plants with mineral nutrients and moisture changed the removal of nutrients by plants and the relative behavior of various nutrient elements.--Copyright 1976, Biological Abstracts, Inc.
W76-10962

GERMINATION OF WEED SEEDS DEPENDING ON SOIL MOISTURE AND DENSITY, (IN RUSSIAN),
A. V. Fisyunov.
Dokl Veses Ordena Lnina Akad S-KH Nauk IM V I Lenina 1, p 18-20. 1975.

Descriptors: *Germination, Seeds, Planting maagement, *Soil moisture, *Weeds.
Identifiers: Barnyard millet, Black bindweed, Millet, Pennycress, Ragweed, Tumbleweed, White goosefoot, Bristlegrass, Redroot amaranth.

Data are presented on the germination of seeds of ragweed, black bindweed, white goosefoot, barnyard millet, green and yellow bristlegrass, tumbleweed, redroot amaranth and field pennycress in loose and compact soil with a moisture content of 36.9, 21.2 and 15.6%.--Copyright 1976, Biological Abstracts, Inc.
W76-10965

COMBINED DRAIN AND FLOOD GATE,
H. J. Soileau.
U. S. Patent No. 3,953,978, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 44, May 4, 1976.

Descriptors: *Patents, *Irrigation, *Flood irrigation, *Irrigation systems, Gates, Spillways, Flow control, Controlled drainage, Diversion structures, Floodways, Spillway gates, Flood control.

A combined drain and flood gate is employed in irrigation and flood control systems and is installed in a levee, bank, dam or the like separating two adjacent land areas for controlling water flow from one area to the other to maintain one area at a predetermined flood level or to completely drain one area into the other. The gate includes a vertically movable panel forming a gate in a spillway or passageway and a drain gate which can be opened and is at the lower level than the vertically movable gate for completely draining water from one area into another. (Sinha-OEIS)
W76-10968

TRICKLE IRRIGATOR,
Rain Bird Sprinkler Mfg., Corp., Glendora, Calif. (Assignee).
W. J. Wichman, and R. A. Vander Ploeg.
U. S. Patent No. 3,954,223, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 125, May 4, 1976.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Irrigation practices, *Irrigation efficiency, Valves, Flow, Flow control, Irrigation operation and maintenance.
Identifiers: Trickle irrigation, Flushing.

The invention provides a trickle-flow irrigation valve which has the desirable features of automatic and manual flushing, low-pressure and low-volume flow, pressure regulation, and anti-siphoning action. The valve includes an inlet tube sealable insertable through the wall of a water supply hose. A pressure chamber has an inlet passage connected to the inlet tube and an outlet passage through the wall of the chamber. An interior wall of the chamber has a shallow channel formed in it intersecting with the outlet passage, and an outlet groove is formed in the center of the channel and also intersects with the outlet passage. On an initial flow of water into the pressure chamber, a flushing action occurs, since a relatively high-volume flow occurs along the channel and groove until pressure builds up in the chamber. The supply pressure in the chamber then deforms the resilient valve element into the shallow channel, restricting flow under the element to the cross-section of the outlet groove, which is appropriately sized to produce the desired flow rate. The outlet groove is long enough to produce a substantial frictional pressure drop between the pressure chamber and the outlet passage, so that a desired low-pressure flow is obtained. (Sinha-OEIS)
W76-10970

REACTION ARM FOR ROTARY SPRINKLER,
Greeno (John S.), Inc., Cincinnati, Ohio. (Assignee).
R. H. Eby.
U. S. Patent No. 3,952,953, 6 p, 18 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1729, April 27, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Distribution systems, Irrigation practices, Irrigation efficiency, Application equipment, Plastics.

A reaction arm for rotary sprinklers is made of injection molded nylon. The arm is formed in two parts including a head and a main body portion. The head contains the spray diverting and deflecting passageways and the main body portion has a head-supporting shoe on one end, an intermediate pivot portion, and a counterweight portion. The shoe is received within an opening in the head and forms one wall of the water passageway. A counterweight may be added to the arm adjacent the head to provide additional mass to the reaction arm for proper operation of the sprinkler. (Sinha-OEIS)
W76-10978

A METHOD FOR DETERMINING THE IRRIGATION REQUIREMENT IN ANTIGUA, W. I.,
MacDonald Coll., Montreal (Quebec).
R. W. Borden.
Tropical Agriculture, Vol. 53, No. 1, p. 41-45, 1976. 2 fig., 1 tab.,7 ref.

Descriptors: *Methodology, *Water utilization, *Irrigation water, *Vegetable crops, Tropic, Evapotranspiration, Rainfall, Water balance, *Water requirements.
Identifiers: *Antigua(West Indies).

A rapid method for determining irrigation water requirements of vegetable crops in Antigua, West Indies, is described. Neither actual or potential evapotranspiration values have been measured, but some climatic and long term rainfall data are available. Empirical formulas using wind, temperature, sunshine, and evaporation were used to calculate evapotranspiration. Mean evapotranspiration was 60% (49-98%) for February-September and 76% for October-January. Several empirical methods of assessing daily evapotranspiration from meteorological data are discussed. The irrigation water required will be approximately the difference between mean rainfall and evapotranspiration calculated from meteorological data, with consideration for rainfall effectiveness, irrigation efficiency, and variations in crops. An average water balance was constructed showing that only November had no irrigation requirement; September and October were low demand months. The daily evapotranspiration for a vegetable crop was estimated and used to plot the estimated total evapotranspiration for vegetables according to percentage crop maturity and time of year. Knowing the month, percentage of growing season lapsed, and days since the last irrigation, total evapotranspiration can be read from the graph and the irrigation interval calculated. Accuracy will improve when various factors have been measured. (Buchanan-Davidson--Wisconsin)
W76-10981

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

STRATEGIES FOR NATURAL RESOURCE DECISION-MAKING: COMMENTS ON THE STAFF REPORT,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6E.
W76-10503

INTERBOARD PLAN FOR THE GREATER FINGER LAKES - OSWEGO RIVER BASIN,
New York State Dept. of Environmental Conservation, Albany.
November 1973. 17 p, 1 fig, 2 plates, 2 tab.

Descriptors: *Resources development, *Water resources, *Planning, *Management, *River basin development, *Non-structural alternatives, Environmental effects, Reservoirs, Flood protection, Water supply, Recreation, Agriculture, Navigation, Wildlife, Electric power, *New York.
Identifiers: Greater Finger Lakes(NY), *Oswego River Basin(NY).

The river basin of this report covers 5,122 sq mi of New York State, 280 sq mi of which are covered by water including Lakes Canandaigua, Keuka, Seneca, Cayuga, Owasco, Skaneateles, Otisco, Onondaga, and Oneida. Water has been basic to development in the region, which contains more than one million people, dating back to at least 1825 with the completion of the first Erie Canal. Regional resource management is needed in a number of ares including: municipal and industrial water supply, flood damage reduction, water quality, agriculture, recreation, wildlife, navigation, and electric power. This report deals with these areas in the early action period of 1973 to 1980. Non-structural solutions and specific development measures are discussed briefly. An integral part of the plan is a computerized model of the basin's lakes and rivers which provides guidelines on lake levels and river flows to meet multiple water uses. Specific objectives and coverage of plan aspects are summarized. Objectives for lake level regulation during summer and winter are given; the number of miles of shore being managed for flood damage reduction is specified. Recommendation stress the interconnected nature of decisions about resource use: each decision by a local authority affects the way resources may be used by other localities. Managements include communications, data processing and analysis, and cooperation among authorities. In the case of watershed conservation, the boards recommend the acceleration of land conservation programs throughout the basin on a coordinated basis using the capabilities of soil and water conservation districts. (Smith-North Carolina)
W76-10506

THE ECONOMIC IMPACT OF RECREATIONAL LAND-USE IN AN ISLAND ENVIRONMENT: A CASE STUDY OF JEKYLL ISLAND, GEORGIA,
Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 6B.
W76-10581

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL 1),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10605

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
M. B. Badenhop, and R. M. Thomsen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 647, $4.50 in paper copy, $3.00 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No. 49, June 1976. 61 p, 2 fig, 9 tab, 21 ref, append. OWRT A-039-Tenn(1). 14-34-0001-6044.

Descriptors: *Water management(Applied), Erosion, Sediments, Water quality, Costs, *Land use, Soil erosion, Crop production, Income, *Tennessee, River basins.
Identifiers: Obion-Forked Deer River basin(Tenn), Farm income, Opportunity cost, Agricultural income.

This report is concerned with the effect of water and land management practices on farm income in the upland areas of the Obion-Forked Deer River Basin in Northwest Tennessee. Farm enterprises and resource constraints were quantified and evaluated in a linear programming framework. The problemshed approach was used which involved the use of a Standard (upper limit) on the amount of residual (eroded soil) discharged by the externality producer into the environment (stream). Farm budgets were used to obtain cost and return data on typical farming practices used by farmers in the Basin. The maximum potential net income for the uplands subject to resource constraints was calculated. Then, a soil erosion discharge standard was used to set the maximum allowable level of soil (10 tons per acre) that could be eroded. A system of land use practices was generated to meet this standard. The maximum net returns to the uplands were recalculated subject to the original constraints plus the discharge standard and recommended cropping practices. The difference between these two net return values was an estimate of the opportunity cost involved. The estimated opportunity cost was approximately $4.3 million on an annual basis. This loss in potential agricultural income is considered the minimum cost with such an agricultural production change to limit soil erosion to a maximum of 10 tons per acre.
W76-10612

COMPARING INFLOW AND INFILTRATION,
Pool (Charles) and Associates, Inc., Ketchikan, Alaska.
For primary bibliographic entry see Field 5D.
W76-10683

THE EVAPORATION AND SEDIMENTATION IN MAN-MADE ARADE LAKE, SOUTHERN PORTUGAL,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 2D.
W76-10703

ON THE CALCULATION OF THE MEAN RESIDENCE TIME IN MONOMICTIC LAKES,
Commission of the European Communities, Ispra (Italy). Joint Nuclear Research Center.
For primary bibliographic entry see Field 2H.
W76-10704

SELECTION OF TYPICAL SMALL DRAINAGE BASINS FOR INVESTIGATING AND COMPUTING SPRING RUNOFF FROM LARGE RIVER BASINS,
L. K. Vershinina, and O. I. Krestovskiy.
Soviet Hydrology: Selected Papers, Issue No. 6, p 355-363, 1974. 3 fig, 3 tab, 8 ref. Translated from Transactions of the State Hydrologic Institue, (Trudy GGI), No. 218, p 132-144, 1974.

Descriptors: *Drainage area, *Runoff forecasting, *River basins, Physiographic provinces, Forecasting, Runoff, Networks, Basins, Spring, Meteorology, Floods.
Identifiers: *Small drainage basins, *Large river basins, Spring flood, Spring runoff, Graphic relations.

Investigation of two drainage basins with areas of 2000 to 10,000 sq km showed that they could be used to determine the annual spring runoff depths of large river basins with a high degree of accuracy. In regions where the spring flood runoff accounted for the major part of annual runoff, these small basins also characterized the annual runoff of large river basins. The computation error did not exceed 10% when the values from several small basins totalled 15-25% of the area of the large basin. The root-mean-square error of the computations was 4-8 mm, or 10-30% of the natural variation in spring runoff depth. Use of small areas in large river basins made it possible to increase the density of the observation network and concentrate various kinds of observations, thus improving the quality of all measurements. (Roberts - ISWS)
W76-10705

DENSITY CURRENT SURGES I--THEIR ROLE IN THE INITIAL DISPERSION OF A SURFACE FIELD,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10707

DENSITY CURRENT SURGES II--THE MOVEMENT OF SURGES IN A TURBULENT ENVIRONMENT AND THEIR ROLE IN SURFACE FIELD DISPERSION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10708

ILLINOIS LAWS RELATING TO WATERWAYS 1973.
Illinois State Dept. of Transportation, Springfield. Div. of Waterways.
For primary bibliographic entry see Field 6E.
W76-10720

SOUTH DAKOTA'S SYSTEM OF WATER MANAGEMENT AND ITS RELATION TO LAND USE AND ECONOMIC DEVELOPMENT,
South Dakota Univ., Vermillion. School of Law.
W. A. Garton.
South Dakota Law Review, Vol. 21, No. 1, p. 1-77 (1976). 77 p, 1 chart.

Descriptors: *Land use, *South Dakota, *Water utilization, *Riparian rights, *Appropriation, *Planning, Legislation, Competing uses, Legal aspects, Prescriptive rights, Constitutional law, Interstate compacts, Regulated flow, Water conservation, Water distribution, Water requirements, Water resources, Administrative agencies, Federal government, State governments, Reservation doctrine, Federal jurisdiction, Social aspects, Interstate rivers.
Identifiers: Marketable water rights.

The present water law system of South Dakota may be inadequate to deal with increases in demand for water and with changing public needs and expectations. The author reviews pre-1955 riparian law and appropriation law and their interrelationship. The examination of current water doctrines includes the underlying policy provisions, protection of vested rights, waters available for appropriation, priorities of water rights, abandonment and forfeiture of water rights, transfer of water rights, acquisition of water rights by prescription, and maintenance of minimum flows in streams. The methods used by Colorado and Idaho for maintenance of minimum flow are detailed. Development of future policies for water utilization will require publicly decided priorities for competing uses and implementation of these priorities. The possibilities and problems of marketable water rights are evaluated. Also examined are the roles of state agencies dealing with water use. No radical changes are deemed necessary since the constraints of the federal system limit the state's control of its waters. These constraints include the federal navigability doctrine, the federal reservation doctrine, the 'Winters Doctrine', and the right of neighboring states to their aliquot share. (Capehart-Florida)
W76-10721

MATCHING RESOURCES AND PEOPLE,
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 6B.
W76-10723

INDIAN WATER RIGHTS: SOME EMERGING FRONTIERS,
Native American Rights Fund, Boulder, Colo.
For primary bibliographic entry see Field 6E.
W76-10729

A PROPOSAL FOR ADOPTION OF A LEGAL DOCTRINE OF GROUNDSTREAM WATER INTERRELATIONSHIP IN TEXAS,
Saint Mary's Univ., San Antonio, Tex. School of Law.
For primary bibliographic entry see Field 4B.
W76-10731

DAMS OF PORK,
For primary bibliographic entry see Field 6B.
W76-10738

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-10742

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 2).
For primary bibliographic entry see Field 6E.
W76-10750

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 4).
For primary bibliographic entry see Field 6E.
W76-10751

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 5).
For primary bibliographic entry see Field 6E.
W76-10752

METEOROLOGICAL ASPECTS OF THE OAHU FLOOD OF 19 APRIL 1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W76-10807

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI. APPENDIX E, F, G, (ENVIRONMENTAL IMPACT STATEMENT.
Army Engineer District, Kansas City, Mo.
January 1973. 265 p, 1 fig, 2 map, 4 photo.

Descriptors: *Dams, *Missouri, *Flood control, *Hydroelectric power, *Reservoir sites, Recreation facilities, Judicial decisions, Social impact, Public health, Government finance, Governmental interrelations, Water resources development, Environmental effects.
Identifiers: Harry Truman Dam, Kaysinger Reservoir, Letters of reply.

Appendix E contains 22 letters of reply conveying various departments' and groups' views on the draft environmental statement prepared for the Harry S. Truman Dam project. Replies were received from several large governmental departments, such as the Environmental Protection Agency, Department of the Interior, and the Department of Agriculture. Appendix F contains the court orders in cases involving the dam project. The orders presented include those by the Honorable John Oliver, the United States 8th Circuit Court of Appeals, and the United States Supreme Court. Appendix G presents the recommendations of the Bureau of Sport Fisheries and Wildlife at Billings, Montana concerning the acquisition of land for wildlife purposes at the Kaysinger Reservoir, a part of the Harry S. Truman Dam project. (See also W76-04654) (Hoffman-Florida)
W76-10827

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W76-10832

ENTROPY PRINCIPLE APPLIED TO THE RAINFALL-RUNOFF PROCESS,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 2A.
W76-10918

SEEPAGE FLOW THROUGH HOMOGENEOUS SOIL INTO A ROW OF DRAIN PIPES,
Waikato Univ., Hamilton (New Zealand). Dept. f Mathematics.
A. D. Sneyd, and R. J. Hosking.
Journal of Hydrology, Vol. 30, No. 1/2, p 127-146, May 1976. 2 fig, 7 tab, 7 ref, 1 append.

Descriptors: *Seepage, *Drains, *Soil water movement, *Numerical analysis, Fourier analysis, Algorithms, Equations, Boundary processes, Homogeneity, Infiltration, Pipes, Drainage systems, Darcys law, Potential flow, Soil surfaces.
Identifiers: *Drain gap, Asymptotic expansion, Axial symmetry, Cylindrical polar coordinates.

The effect of gap width on flow through homogeneous porous soil into a row of drain pipes was considered, by solving Darcy's law in a model configuration with axial symmetry. The resulting mixed boundary value problem of potential theory was reduced to a Fredholm integral equation of the first kind, which may be solved numerically. In practice, however, the gap width between pipes was small enough to justify an asymptotic expression for the relative flow found by the method of matched asymptotic expansions. To lowest order, it appears that the flow is sensitive to the gap parameters, not on the geometry far away from the gap. In the limit of large pipe radius and shallow depth, earlier two-dimensional results were recovered. (Visocky - ISWS)
W76-10919

PARTIAL DEPLETION OF SALINE GROUNDWATER BY SEEPAGE,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10920

A NOTE ON THE CONTRIBUTION OF FOG DRIP TO STREAMFLOW,
Southampton Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W76-10927

FIELD AND LABORATORY EVALUATION OF BI-LEVEL DRAINAGE THEORY,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu, and D. W. DeBoer.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 478-481, May-June 1976. 5 fig, 6 tab, 9 ref.

Descriptors: *Drainage systems, *Theoretical analysis, *On-site tests, *Laboratory tests, Water table, Water levels, Hydraulic conductivity, Porosity, Drains, Data collections, Depth, Graphical analysis, Groundwater movement, Aquifers, Viscosity.
Identifiers: *Bi-level drainage, Hele-shaw model, Drain spacing.

Field and laboratory evaluations of a proposed bi-level drainage (system in which drains are at two different depths on an alternating basis) theory were presented. Graphical comparisons were made between the fall of the water table as predicted by theory and as measured both in the field and in a Hele-Shaw model. In both cases the agreement was good, indicating that the theory is an adequate model to describe the water table fall. (Visocky-ISWS)
W76-10934

UPSTREAM FLOOD LOWERING IN RESERVOIRS,
Tennessee Valley Authority, Knoxville.
B. Buehler.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY2, Proceedings Paper 11911, p 151-170, February 1976. 8 fig, 5 tab.

Descriptors: *Backwater, *Reservoirs, *Tennessee, *Curves, Upstream, Discharge measurement, Stream gage, Flood control, Flood peak, Hydraulics, Rating curves, Roughness coefficient.
Identifiers: *Upstream flood lowering, Tennessee Valley reservoirs, Cost savings, Project planning stage, Reservoir life.

Dams can lower flood levels near upstream limits of their reservoirs. This lowering was observed at four Tennessee Valley locations. The phenomenon is called 'upstream flood lowering.' It results from increased flow carrying capacity primarily due to deep longstanding reservoir waters in alluvial valleys. This smoothes channel linings and eliminates vegetation. The effect occurrs early in reservoir life and is permanent. This paper and its eight figures was prepared in 1954 and presented at a meeting that year, but was not published until 1974. The twenty years of added data confirmed upstream flood lowering but showed that the lowering was underestimated significantly at one and somewhat at two of the four locations. (Roberts - ISWS)
W76-10938

A DISCRETE LINEAR CASCADE MODEL FOR HYDROLOGY,
University Coll., Galway (Ireland).
For primary bibliographic entry see Field 2E.
W76-10946

PROBLEMS OF PUBLIC WORKS PROJECTS IN THE PRESENT ECONOMIC CLIMATE,
San Bernardino Valley Municipal Water District, Calif.
For primary bibliographic entry see Field 6C.
W76-10980

COMPREHENSIVE WATER SUPPLY STUDY FOR NEW YORK STATE,
New York State Dept. of Health, Albany. Bureau of Public Water Supply.
For primary bibliographic entry see Field 6B.
W76-10982

SEEPAGE LOSS FROM HOLDING PONDS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5B.
W76-11051

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11072

TECHNIQUES FOR ESTIMATING FLOOD DEPTHS FOR OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, Okla.
W. O. Thomas, Jr.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 310, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-2, April 1976. 38 p, 12 fig, 2 tab, 9 ref.

Descriptors: *Flood forecasting, *Peak discharge, *Depth, *Flood recurrence interval, *Oklahoma, Flood plains, Natural flow, Stream gages, Urban hydrology, Analytical techniques, Regression analysis, Probability, Flood profiles, Hydrologic data, Data collections.

Regional relations are defined for estimating the depths of floods having recurrence intervals ranging from 2 to 100 years for both natural and urban streams in Oklahoma. Contributing drainage area and the 2-year 24-hour rainfall are the only independent variables required for estimating flood depths for natural streams. For urban streams the percentage of the basin impervious and served by storm sewers is also required. The only limitations are that the stream be unregulated, that the main channels be unimproved, and that the contributing drainage area and the 2-year 24-hour rainfall be in the range of values used to derive the relations. The standard errors of estimate range from 24 percent for the 50- and 100-year floods to 33 percent for the 2-year flood for the natural streams. The estimation error for urban streams is not evaluated due to paucity of data. Although the flood depths estimated from techniques presented in this report are considered less reliable than those obtained from field surveys and hydraulic computations, the ease and simplicity of their determination are expected to make them useful for many purposes. Data on flood depths for 132 gaging stations are given. (Woodard-USGS)
W76-11075

HYDROLOGIC EFFECTS OF STORMS OF JUNE 24-28, 1974 IN LEE AND COLLIER COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla.
R. A. Miller, and M. A. Benson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-252-324/as, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 57-75, January 1976. 30 p, 11 fig, 5 tab, 9 ref.

Descriptors: *Storms, *Floods, *Flood damage, *Hydrologic data, *Flood frequency, *Florida, Hurricanes, Streamflow, Peak discharge, Rainfall. Identifiers: Lee and Collier Counties(Fla), Hurricane Donna.

The storms of June 24-28, 1974, in Lee and Collier Counties, Florida, produced widespread flooding, beach erosion, and utility failures. Recurrence intervals of the rainfall at Fort Myers are less than 5 years for durations under 6 hours, and less than 10 years for duration under 2 days. Recurrence intervals for peak groundwater elevations in Lee and Collier Counties as a result of the storm are less than 5 years, as are the recurrence intervals for both stage and discharge in streams. (Woodard-USGS)
W76-11077

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER IN TOWNS OF FRANKFORT AND SCHUYLER, HERKIMER COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
T. J. Zembrzuski, Jr., and B. Dunn.
Open-file report 76-413, June 1976. 8 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Flood flow, *Flow characteristics, *Bridge design, *Peak discharge, Hydrologic data, Streamflow, Engineering structures, Bridge construction, Rivers, *New York.
Identifiers: Herkimer County(NY), *Mohawk River(NY).

An evaluation of floodflow characteristics at a proposed bridge site on Mohawk River in the towns of Frankfort and Schuyler, Herkimer County, N.Y., revealed that: (1) The 100-year design discharge is 22,500 cfs, of which 21,200 cfs flows in the Mohawk River and 1,300 cfs flows in the Erie (Barge) Canal. (2) The existing bridge and road would be submerged and would cause no backwater during the 100-year flood. (3) The normal elevation for the 100-year flood at the approach section is 406.3 feet referred to mean sea level, datum of 1929. (4) Three alternate bridge designs would cause a 2.1-, 0.5-, and 0.3-foot increase in water level, respectively, at the approach section during the 100-year flood. (5) The combination of one of the alternate bridges and three overflow culverts would cause a 0.4-foot increase in water level at the approach section during the 100-year flood. (Woodard-USGS)
W76-11079

FLOOD FREQUENCY OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
B. E. Colson, and J. W. Hudson.
Progress Report, May 1976. 34 p, 8 fig, 3 tab, 12 ref.

Descriptors: *Flood frequency, *Flood forecasting, *Flood recurrence interval, *Mississippi, *Streams, Methodology, Mathematical models, Hydrologic data, Regression analysis, Digital computers, Topography, Synthetic hydrology, Drainage area, Rainfall-runoff relationships.

Techniques have been developed for estimating future flood magnitudes for Mississippi streams having recurrence intervals as great as 100 years. Estimates for gaged sites were obtained by application of the log-Pearson Type III frequency distribution. Estimates for ungaged sites are defined by mathematical relations which may be solved using data from topographic maps. Nomographs were designed for making rapid estimates for flood-frequency values. Synthetic records generated by a digital computer model of the rainfall-runoff process for drainage areas ranging from 0.04 to 4.35 sq mi were combined with long-term observed records to define the relation of basic characteristics to flood frequency on drainage areas as great as 6,630 sq mi. Multiple-regression techniques indicated that drainage area, slope, and length were the most significant variables affecting flood frequency. (Woodard-USGS)
W76-11083

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-11084

SIMPLIFIED ROUTING OF DAM BREAK WAVES,
Geological Survey, Bay St. Louis, Miss., and Geological Survey, Reston, Va.
T. N. Keefer, and R. S. McQuivey.
In: Fundamental Tools to be Used in Environmental Problems; Proceedings of 16th Congress of International Association for Hydraulic Research, Sao Paulo, Brazil, July 27-August 1, 1975, Volume 2, p 325-329, 1975. 3 fig, 4 ref.

Descriptors: *Hydraulic models, *Dam failure, *Flood routing, *Regression analysis, Flood profiles, Hydrographs, Methodology, Equations, Dam design, Evaluation, Model studies.
Identifiers: *Multiple-linearization technique.

One-dimensional flow routing schemes based on finite-difference techniques are commonly used to analyze dam break problems. Such techniques provide accurate answers but require large amounts of cross-section and roughness information. The routing model evaluated here is the multiple-linearization technique. It treats the routing reach as a series of linear systems. The model is checked by comparing routed flood hydrographs obtained from the multiple-linearization and finite-difference models in both rectangular and non-rectangular primatic channels. There is no significant difference between the results for the cases investigated. The multiple-linearization model is considerably less expensive to operate. (Woodard-USGS)
W76-11085

4B. Groundwater Management

WATER QUALITY AND ECONOMIC CRITERIA FOR RURAL WASTEWATER AND WATER SUPPLY SYSTEMS,
Duke Univ., Durham, N. C. School of Forestry.
For primary bibliographic entry see Field 5D.
W76-10583

AN EMPIRICAL NA-K-CA GEOTHERMOMETER FOR NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W76-10598

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-10608

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT: PARAMETER IDENTIFICATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-10613

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 5G.
W76-10656

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-10657

DEVELOPMENT OF A METHODOLOGY FOR MONITORING GROUNDWATER QUALITY,
California Univ., Berkeley.
For primary bibliographic entry see Field 5A.
W76-10658

MONITORING GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5A.
W76-10659

MANAGEMENT OF GROUNDWATER QUALITY DATA,
Commonwealth Associates, Inc., Jackson, Mich.
For primary bibliographic entry see Field 5A.
W76-10660

GROUNDWATER POLLUTION MONITORING CASE STUDIES,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5A.
W76-10661

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5D.
W76-10662

LAND DISPOSAL OF WASTES: POTENTIAL FOR GROUNDWATER POLLUTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10667

CONFORMITY OF GROUNDWATER RECHARGE RATE BY TRITIUM METHOD AND MATHEMATICAL MODELLING,
National Geophysical Research Inst., Hyderabad (India).
For primary bibliographic entry see Field 2F.
W76-10700

WATER TRACING IN TROPICAL REGIONS, THE USE OF FLUOROMETRIC TECHNIQUES IN JAMAICA,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-10701

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
E. W. Sanderson, and E. Zewde.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 796, $6.00 in paper copy, $3.00 in microfiche. Circular 124, 1976. 139 p, 16 fig, 2 tab, 39 ref, 2 append.

Descriptors: *Groundwater availability, *Water quality, *Water wells, *Illinois, Wells, Deep wells, Shallow wells, Water chemistry, Hardness(Water), Water analysis, Water supply, Municipal water, Groundwater resources, Groundwater, Aquifers, Glacial aquifers, Geology, Hydrogeology, Water sources, Water yield, Water table, Subsurface waters, Water treatment, Pumping.
Identifiers: *Champaign County(Ill).

Groundwater in Champaign County normally can be obtained from one of three primary water-bearing sand and gravel units within the glacial drift materials. These materials were deposited on top of the bedrock formations during three ages of glaciation. The lower aquifer system is associated with a major bedrock valley in the northwest portion of Champaign County. About 84% of the county's water supply is pumped from this sand and gravel aquifer. Groundwater from the glacial deposits is hard (250 to 600 mg/l) and normally contains objectionable concentrations of iron (1 to 5 mg/l). These undersirable constituents can be successfully removed with home or municipal treatment units. An estimated 23.3 million gallons a day (mgd) of water is pumped from the aquifers of Champaign County to satisfy industrial, municipal, domestic, and rural needs. A much larger quantity of water, perhaps as much as 90 mgd, could probably be withdrawn without overdevelopment. This report describes pertinent geologic factors, groundwater occurrence and movement, temperature and chemical quality, and well development. Appendix A contains available records of all known wells, and appendix B lists the results of chemical analyses of water from all wells sampled. (Sims - ISWS)
W76-10718

PUBLIC GROUNDWATER SUPPLIES IN MCHENRY COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 633, $4.50 in paper copy, $3.00 in microfiche. Bulletin 60-19, 1976. 52 p, 3 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Aquifers, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water resources, Water quality, Water wells, Municipal water, Water yiel, Water properties, Hardness(Water), Chemical properties, Wells, Shallow wells, Deep wells, Geology.
Identifiers: *McHenry County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in McHenry County, Illinois. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock are tapped by 26 public water systems in McHenry County as a source of all or part of their water supply. There are presently 43 production and standby wells, ranging in depth from 47 to 272 ft, tapping only the sand and gravel deposits. Their reported yields range from 15 to 1350 gpm depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Production from these wells in 1973-1975 was estimated to be about 6,550,000 gpd. The analyses of water from these wells show that the iron content ranges from 0.0 to 3.9 mg/l and the hardness from 204 to 512 mg/l. Individual production wells for each supply were described in the order of their construction. The description for each well includes the aquifer or aquifers tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Sims - ISWS)
W76-10719

EQUITABLE APPORTIONMENT OF INTERSTATE GROUND WATERS,
Fischer and Beatty, Fort Collins, Colo.
W. H. Fischer.
Rocky Mountain Mineral Law Institute, Vol. 21, p. 721-741 (1975). 22 p, 41 ref.

Descriptors: *Equitable apportionment, *Legal aspects, *Legal aspects, *Legal review, *Groundwater, *Groundwater resources, State governments, State jurisdiction, Boundary disputes, Riparian rights, Riparian water loss, Appropriation, Judicial decision, Exploitation, Groundwater potential, Water utilization.

Examined here are the rights of the respective states to groundwater flowing across state boundaries. The law of groundwater has been slow to develop; however, the common law rule allowing withdrawal without regard to outside effect has gradually been modified by the Reasonable Use Rule and the Correlative Rights Doctrine. In addition to determining which of these rules or doctrines will be applied, a party considering private litigation over injurious groundwater withdrawal may also have problems deciding where to sue and where the injury actually occurred. The author suggests equitable apportionment as a substitute for private litigation. Different Supreme Court cases are cited that support a trend towards interstate apportionment, even between riparian and apportionment doctrine states. These cases, often between States and thus originating in the Supreme Court, have the basic problem of presenting adequate proof of damages from withdrawal. Ultimately, equitable apportionment can best be achieved by interstate compacts. (Frank-Florida)
W76-10728

INDIAN WATER RIGHTS: SOME EMERGING FRONTIERS,
Native American Rights Fund, Boulder, Colo.
For primary bibliographic entry see Field 6E.
W76-10729

A PROPOSAL FOR ADOPTION OF A LEGAL DOCTRINE OF GROUNDSTREAM WATER INTERRELATIONSHIP IN TEXAS,
Saint Mary's Univ., San Antonio, Tex. School of Law.
J. N. Castleberry, Jr.
St. Mary's Law Journal, Vol. 7, No. 3, p. 503-14 (1975). 12 p.

Descriptors: *Texas, *Groundwater resources, *Judicial decisions, *Percolating waters, *Water supply development, Water pollution, Federal government, Legislation, Legal aspects, Water pollution control, Water pollution effects, Common law, Law enforcement, Legal review, Water permits, Classification, Laws, Underground, Water resources, Groundwater movement, Underground streams.

The courts and legislature of Texas have failed to produce a workable solution to the state groundwater problem. Instead, the law has evolved groundwater classification predicated upon that point in the water cycle at which water is taken for use. Subterranean waters, for example, have been classified into percolating waters and underground streams. The 'English Rule' established that the owner of the freehold absolutely owned all the waters percolating beneath his surface tract. Many American States rejected the 'English Rule' to adopt the reciprocal reasonable use - correlative rights view, also known as the 'American Rule'. This rule states that a property owner whose property overlies a reservoir common to several tracts containing percolating water is restricted to such use of the water as is reasonable with respect to his own use and that of the other landowners whose tracts overlie the reservoir. Texas courts follow the English Rule in cases involving rights in percolating waters but apply 'surface stream' rules to subterranean streams and have stated that if the 'American Rule' is to be adopted, the change must come through legislative action. Texas decisions have not yet explored differences between percolating waters which never become part of a flowing stream and percolating waters which contribute to the flow of streams. The author con-

cludes that the legislature should take advantage of the first opportunity to adopt and implement a modern scientific groundwater concept which recognizes the interrelationship between surface and ground waters. (Hadoulias-Florida)
W76-10731

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-10742

AN ANALOG MODEL OF THE CHIPUXET AQUIFER, RHODE ISLAND,
Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2F.
W76-10814

ADJUSTMENTS DUE TO A DECLINING GROUNDWATER SUPPLY: HIGH PLAINS OF NORTHERN TEXAS AND WESTERN OKLAHOMA,
Texas A and M Univ., College Station. Water Resources Inst.
R. D. Lacewell, L. L. Jones, and J. Osborn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 792, $4.00 in paper copy, $3.00 microfiche. Technial Report, No. 74, June 1976. 42 p, 1 fig, 10 tab, 35 ref. OWRT B-179-TEX(2), 14-31-0001-4165.

Descriptors: *Regression analysis, Model studies, Community development, *Texas, *Oklahoma, *Groundwater, Economics, Water supply, Aquifers, Irrigation, Agriculture, *Linear programming, Costs.
Identifiers: Exhaustible aquifer, Community services, *Interindustry analysis, Ogallala aquifer, *High Plains(Tex.-Okla.) Cost adjustments.

Reduced annual withdrawals of groundwater for irrigating agricultural crops due to a progressively declining water supply will exert significant downward pressure on the economy of the region. The reduced agricultural output will be reflected throughout the region in terms of population, employment and gross output of non-agricultural sectors. The declining groundwater supply affects costs of providing community services. Of particular significance is the expected effect on smaller communities (less than 5,000) where rather dramatic increases in costs of community services are indicated. The structure of the Northern High Plains economy has been quantified. Data have been developed relative to expected changes in population, employment, per capita disposable income and agriculture and non-agricultural output. This provides information to planners in developing policy for regional development. Models are provided for estimating the impact of alternative policies such as water importation or encouragement toward rapid growth in specific industries. Limitations of these models are explicitly defined. Verification is presented that regional projects crossing university and state lines can be most successful. For a major problem as the declining groundwater in the Northern High Plains, there are several affected communities and two states. By cooperating and joining in a single project a much superior product evolved than that could be expected from each university operating independently.
W76-10874

PARTIAL DEPLETION OF SALINE GROUNDWATER BY SEEPAGE,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-10920

GEOTHERMAL ENERGY RECOVERY PROCESS,
Bechtel International Corp., San Francisco, Calif.
For primary bibliographic entry see Field 3A.
W76-10967

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-11063

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5A.
W76-11065

GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W76-11066

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-11068

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-11070

GROUND-WATER LEVELS IN NEW MEXICO, 1974,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2F.
W76-11073

GEOHYDROLOGY OF THE ANZA-TERWILLIGER AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Moyle, Jr.
Available from the National Tecnical Information Service, Springfield, Va 22161, as PB-252-834, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-10, March 1976. 25 p, 12 fig, 2 tab, 14 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Withdrawal, *Water level fluctuations, *Water quality, Pumping, *California, Hydrologic data, Aquifer characteristics, Streamflow, Water utilization, Land use, Nitrates.
Identifiers: Riverside County(Calif), *Anza-Terwilliger area(Calif).

The Anza-Terwilliger area consists of about 96 square miles (249 square kilometers) in the upper parts of the Santa Margarita River and Coyote Creek drainage basins in Riverside County, Calif., about 90 miles (145 kilometers) southeast of Los Angeles. This report deals with geology, steady state and transient state of ground water, net depletion of ground water, surface-water flow, precipitation, chemistry of water, land and water use, and gravity data for the area. The rate of ground-water depletion has accelerated since 1950. Pumping depressions adjacent to the Cahuilla Indian Reservation have increased the hydraulic gradient and are causing water beneath the reservation to flow toward these depressions. Total depletion of ground water since 1950 is about 14,000 acre-ft (17.3 cubic hectometers). Ground water in local areas contains concentrations of nitrate above that recommended by the Environmental Protection Agency for human consumption. (Woodard-USGS)
W76-11074

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-11076

RECYCLING GROUND WATER IN WAUSHARA COUNTY, WISCONSIN: RESOURCE MANAGEMENT FOR COLD-WATER FISH HATCHERIES,
Geological Survey, Madison, Wis.
R. P. Novitzki.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-253-408, $4.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-20, A .il 1976. 60 p, 24 fig, 5 tab, 22 ref.

Descriptors: *Groundwater recharge, *Recycling, *Fish hatcheries, *Water quality, *Water management(Applied), Methodology, Ponds, Infiltration, Water quality control, Pumping, Water wells, Water temperature, Cold-water fish, Trout, Salmon, *Wisconsin, Water reuse.
Identifiers: Waushara County(Wisc).

A permanent recharge pond with supplementary ponds would fulfill the needs of a hatchery development at the Greenwood Wildlife Refuge site, Waushara County, Wisconsin, and insure protection of the groundwater system. Recycling water within the local groundwater system can increase the quantity of water available for use, control or avoid environmental pollution, and control temperature of the water supply. Pumped groundwater supplied a fish-rearing facility for 15 months, and the waste water recharged the local groundwater system through an infiltration pond. Eighty-three percent of the recycled water returned to the well. Pumping 300 gpm, combined with recycling, resulted in water-level declines equivalent to a pumping rate of approximately 50 gpm. Using this effective pumping rate in the Their nonequilibrium equation resulted in predicted drawdowns within 0.5 foot of those observed throughout the 15-month period. The concentration of nitrate in the water supply increased only slightly during the 15 months of recycling. The water-supply temperature can be maintained within the optimum range for trout and salmon rearing during recycling. (Woodard-USGS)
W76-11082

4C. Effects On Water Of Man's Non-Water Activities

THE ECONOMIC IMPACT OF RECREATIONAL LAND-USE IN AN ISLAND ENVIRONMENT: A CASE STUDY OF JEKYLL ISLAND, GEORGIA,
Georgia Marine Science Center, Savannah.
For primary bibliographic entry see Field 6B.
W76-10581

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.

For primary bibliographic entry see Field 6G.
W76-10610

STUDIES FOR WILDLIFE ON ENERGY AREAS,
Utah State Div. of Wildlife Resources, Salt Lake City.
For primary bibliographic entry see Field 6G.
W76-10820

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
A. Cochran.
Report No. FWS/OBS-76/10, 1975, 71 p.

Descriptors: *Missouri River, *Bibliographies, Water quality, *Water allocation(Policy), Water demand, Urbanization, Irrigation, Water supply, Energy, *Wildlife, *Fish, Reservoir construction, Water pollution, Aquatic habitats, Wildlife habitats, Decision-making, Streamflow forecasting, Strip mines, Water distribution(Applied), *Environmental effects.
Identifiers: Upper Missouri River Basin.

This annotated bibliography of 234 references was prepared as a part of a research assessment on the fish and wildlife implications of water allocation change to serve energy and other developments in the Upper Missouri River Basin. The bibliography contains a list of 62 bibliographies and other secondary reference materials. It also lists and describes 100 publications on the social and economic effects of energy development, rehabilitation of mined land and disposal of wastes, questions of water supply and demand, studies that deal with energy development in a comprehensive manner, and alternative energy policy studies. A section on water allocation and related legal studies lists and describes 30 publications. The effects of pollutants on aquatic environments and publications dealing directly with the effects of energy development on fish and wildlife are referenced via 42 publications. A subject index is included. (See also W76-10826) (FWS)
W76-10825

FISH AND WILDLIFE IMPLICATIONS OF UPPER MISSOURI BASIN WATER ALLOCATION, A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
W. B. Lord, S. K. Tubbesing, and C. Althen.
Report No. FWS/OBS-76/04, 1975. 114 p.

Descriptors: *Missouri River, *Reviews, *Environmental effects, *Water allocation(Policy), Water demand, Urbanization, Irrigation, Water supply, Energy, *Wildlife, *Fish, Reservoir construction, Water pollution, Aquatic habitats, Wildlife habitats, Decision-making, Streamflow forecasting, Strip mines, Water quality, *Water distribution(Applied).
Identifiers: Upper Missouri River Basin.

Major water allocation changes are occurring in the Upper Missouri Basin because of urban expansion, energy development, and possibly irrigation. Some water can come from existing supplies, irrigation, and new and existing reservoirs. Direct fish and wildlife impacts will occur through streamflow reduction, reservoir construction, water pollution, and through habitat changes caused by reduced water supplies to land areas. Decision-making institutions frequently fail to give adequate weight and protection to fish and wildlife values. Most state water laws fail to safeguard minimum streamflows for fish and wildlife protection. Federal water project planning has been criticized for inadequate consideration of fish and wildlife. Two complementary means of improving this situation are (1) modification of water allocation and decision-making institutions, and (2) provision of more information on potential fish and wildlife impacts. In both cases, research can help improve the current situation. Opportunities for additional research are described. (See also W76-10825) (FWS)
W76-10826

URBAN-INDUSTRIAL EFFECTS ON CLOUDS AND PRECIPITATION,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 111-139. 7 fig, 6 tab, 52 ref.

Descriptors: *Urbanization, *Industries, *Weather modification, Clouds, Precipitation(Atmospheric), Rainfall, Thunderstorms, Weather, Temperature, Climatology, Cloud physics, Air pollution, Pollutants, Radiation, Solar radiation, Turbidity, Cities, Powerplants, Cooling towers, Mills, Agriculture, Urban runoff, Streamflow, Hydrologic aspects, Meteorology.
Identifiers: *Inadvertent weather modification.

Man through modifications of the biosphere has been affecting the atmosphere on local and regional scales for many years. These alterations have been produced by urban-industrial centers, non-urban industrial centers, land use changes in rural areas (deforestation, crop changes, drainage, etc.) and marine areas. A major means whereby man has affected weather has been through his urban environment. The increase in urbanization that began 200 years ago with the industrial revolution has led to relatively significant local and mesoscale changes in the weather in and near urban locales. Since urban areas first proliferated in Europe, considerable scientific attention has been directed to this problem in the European area during the last 100 years. Now that major urban-industrial complexes are prevalent in many countries, worldwide attention to this problem has grown rapidly in the last 20 years, and the development of megalopolises in the United States during the past 30 years has brought with it increasing public and scientific awareness of the degree and the seriousness of urban effects on mesoscale weather and climate. (See also W76-10901) (Sims-ISWS).
W76-10905

URBAN AEROSOLS AND INADVERTENT WEATHER MODIFICATION,
Rockwell International, Thousand Oaks, Calif. Science Center.
G. M. Hidy.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 275-288. 7 fig, 4 tab, 11 ref.

Descriptors: *Aerosols, *Weather modification, *Nucleation, *California, Cities, Air pollution, Pollutants, Chemistry, Particle size, Clouds, Cloud physics, Precipitation(Atmospheric), Rainfall, Fog, Atmosphere, Meteorology.
Identifiers: *Inadvertent weather modification, *Los Angeles(Calif).

Current research on the physical and chemical characteristics of atmospheric aerosols is providing a sounder basis for understanding the behavior of urban haze, including photochemical smog. Such information, combined with more direct measurements of urban cloud condensation nuclei (CCN) and ice forming nuclei (IFN) concentrations, helps to place into perspective the micro or molecular scale process potentially leading to inadvertent weather modification. The Los Angeles atmosphere is a prolific producer of haze over a wide geographical region of Southern California. Yet the differences in CCN or IFN from this area appear to be rather small compared with the 'norms' in other locations. The efficiency of removal of such material combined with dilution in the atmosphere suggest that the influence of Los Angeles on weather changes involving cloud formation over a wide geographical region should be quite subtle in extent and probably undetectable within our limitations of knowledge and instrumentation. However, this conclusion cannot be generalized at this point for all cities, whose air may contain widely different aerosol populations. (See also W76-10901) (Sims - ISWS)
W76-10913

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
W. P. Roberts, and J. W. Pierce.
Estuarine and Coastal Marine Science, Vol. 4, No. 3, p 267-280, 1976. 6 fig, 3 tab, 32 ref.

Descriptors: *Urban runoff, *Sedimentation rates, *Deposition(Sediments), *Estuaries, *Maryland, Sediment transport, Suspended load, Rivers, River flow, Discharge(Water), Tidal effects, Hydraulics.
Identifiers: *Patuxent River(Md), Suspended sediment discharge, Thickness of sediment deposition.

Urbanization leads to increased runoff and sediment discharge during construction, as shown in a year-long study of the Patuxent River drainage basin during a period of intense development for housing. Although precipitation was only 80% of previous years, water discharge to the estuary was 2.4 time the average. A net upstream flux of suspended sediment indicated that all fluvial suspended sediment was deposited in the upper reaches of the estuary. Two areas of net deposition were separated by a central turbidity maximum, which fluctuated in position over a 10-km distance in response to high or 'average' river discharge. During low river discharge, two turbidity maxima were observed; one, corresponding with the salt front; and the other, with a downstream constriction in the estuary channel. The average rate of deposition in the upper 50 km of the estuary was calculated to be 7.45 g per sq cm per year. If approximately 20% of the riverborne sediment was deposited between the tidal limit and the average position of the salt front, then 5.88 g per sq cm were deposited during the study period, forming a layer with an average thickness of 3.7 cm. (Lee - ISWS)
W76-10925

POSSIBLE URBAN EFFECTS ON MAXIMUM DAILY RAINFALL AT PARIS, ST. LOUIS AND CHICAGO,
Meteorologie Nationale, Paris (France).
J. Dettwiller, and S. A. Changnon, Jr.
Journal of Applied Meteorology, Vol. 15, No. 5, p 517-519, May 1976. 2 tab, 12 ref. NSF AEN73-07796.

Descriptors: *Rainfall, *Cities, *Urbanization, Precipitation(Atmospheric), Weather modification, Weather data, Time series analysis, Winter, Summer, Meteorology, Climatology.
Identifiers: *Paris(France), *Chicago(Ill), *St. Louis(Mo), Urban effects, Inadvertent weather modification, Convective precipitation.

The seasonal maximum daily rainfall values for the 1871-1970 period at these three large cities in different climates were studied to discern trends. Upward trends of 19-38% were found in the warm season values at all cities, but no significant up or down trends were found in the cold season values. The upward trends in the warm season appear to reflect both natural climatic changes and inadvertent urban effects on local convective precipitation. (Sims-ISWS)
W76-10929

EFFECT OF VEGETATION ON LATERAL MIGRATION OF ANASTOMOSED CHANNELS OF A GLACIER MELTWATER RIVER,
Calgary Univ., Alberta. Dept. of Geography.
D. G. Smith.
Geological Society of America Bulletin, Vol. 87, No. 6, p 857-860, June 1976. 6 fig, 1 tab, 19 ref.

Descriptors: *Geomorphology, *Canada, *Channels, Erosion, Rivers, Sedimentation, Flood plains, Streams, Hydraulics, Vegetation, Vegetation effects, Bank protection.
Identifiers: *Fluvial geomorphology, *Channel stability, River bank vegetation, Anastomosed channels, Erosion box.

A series of experiments were performed on bank materials of anastomosed channel in flood-plain silt deposits in the Alexandra Valley in Banff Park, Alberta, to determine the effect of vegetation roots on bank erodibility and lateral migration of channels. Underground roots from the dense growth of meadow grass and scrub willow provide the reinforcement of bank sediment and a riprap-like protection of channel banks from river erosion. Result from the experiments suggested that in cool environments with aggrading river conditions where overbank deposition of silt, clay, and fine sand dominate the valley fill, vegetation roots are able to rapidly accumulate and decay very slowly, thus affording protection to banks from erosion in deeper parts of the channels. Experiments were performed with a specially designed erosion box, used as a means to simulate natural erosion conditions and measure the influence of vegetation roots in reducing bank erosion. Results indicated that the bank sediment with 16 to 18% by volume of roots with a 5-cm root-mat for bank protection, typical of the area, had 20,000 times more resistance to erosion than comparable bank sediment without vegetation. Assuming five severe erosion days per year, potential lateral channel migration would amount to 4.2 cm per year. Such resistance, due to vegetation, accounts for the remarkable stability of channels during the last 2,500 yr in the Alexandra Valley. (Lee - ISWS)
W76-10940

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W76-10945

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11072

4D. Watershed Protection

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 5G.
W76-10564

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10567

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.
For primary bibliographic entry see Field 6G.
W76-10610

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W76-10612

AGRICULTURAL SEDIMENT CONTROL FOR WATER QUALITY PROTECTION,
Environmental Protection Agency Washington, D. C. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W76-10617

THE INFLUENCE OF SLOPE AND RAIN INTENSITY ON RUNOFF AND INFILTRATION.
SLETCO, Beirut (Lebanon).
For primary bibliographic entry see Field 2A.
W76-10702

THE ABILITY OF DEBRIS, HEAVILY FREIGHTED WITH COARSE CLASTIC MATERIALS, TO FLOW ON GENTLE SLOPES,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W76-10711

APPLICATION OF THE STANFORD WATERSHED MODEL TO NIGERIAN WATERSHEDS,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-10923

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5B.
W76-10945

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

PERIPHYTIC AND PLANKTONIC ALGAE OF THE LOWER FRASER RIVER IN RELATION TO WATER QUALITY CONDITIONS,
British Columbia Univ., Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10504

CHLORINATED HYDROCARBON RESIDUES IN FISHES FROM THE LOWER FRASER RIVER,
British Columbia, Vancouver. Westwater Research Centre.
For primary bibliographic entry see Field 5C.
W76-10505

SAMPLING TECHNIQUES IN URBAN RUNOFF QUALITY STUDIES,
Canada Centre for Inland Waters, Burlington, Ontario, Hydraulic Div.
J. Marsalek.
American Society for Testing Materials (ASTM), Special Technical Publication 573, 1975, p 526-542. 5 fig, 3 tab, 10 ref.

Descriptors: *Urban runoff, *Storm water, *Storm runoff, Water quality, *Sampling, Model studies, *Water pollution, Calibrations, *Pollutant identification.
Identifiers: Environmental tests.

Sampling techniques employed depend on use of data collected. If only total pollutant yields are important, then inexpensive flow-proportioned composite sampling may be used. When time variation of pollutant concentration is of interest, an empirical model should be established to be used in the experimental design of data collection program for a runoff quality study. Composite sampling techniques include; simple composite samples of water are withdrawn at regular intervals and put in a container; flow-weighted composite, either a constant fraction of the flow is collected or constant volumes are collected which depend on water quality; and pollutant mass-flow-weighted composite sample, by monitoring a particular parameter, samples are collected at preselected constant increments of the cumulative pollutant mass flow. In order to determine the type of sampling and minimum number of samples needed, an empirical model is needed to describe the variation of runoff quality. Several attempts at models are examined. Runoff quality is described either by the rate at which the pollutant is washed from the drainage system or by the variation of the pollutant concentration during the runoff event. It is found in testing models that they are often only applicable to a particular site which is affected by pollutant concentrations which are non-uniform over the urban area. An example is given of experimental design for sequential sampling, but practical aspects are stressed. It is important to avoid systematic sampling error by examining the depth at which the sample is taken, the capability of the sampler, sample cross-contamination, and lack of synchronization between the flow recording and sampling. (Smith-North Carolina)
W76-10509

FACTORS IN THE PURIFICATION OF FLOWING SEWAGE AND ACTIVATED SLUDGE PROCESS - PART 2,
Indian Inst. of Science. Bangalore. Dept. of Biochemistry.
For primary bibliographic entry see Field 5D.
W76-10513

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS VIII. SEPARATION BY MOLECULAR WEIGHTS ON SEPHADEX COLUMNS (ZBYTKOVE LATKY PO AKTIVACNIM PROCESU VIII. DELENI PODLE MOLEKULOVYCH HMOTNOSTI NA SEPHADEXECH),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
J. Chudoba, P. Lischke, F. Tucek, and A. Maglicova.
Scientific Papers of the Institute of Chemical Technology, Prague, F 19 (1974) Technology of Water. 15 fig, 6 tab, 26 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Organic compounds, *Analytical techniques, *Molecular structure, *Weight, Sewage treatment, Biological treatment, Activated sludge, Sewerage, Chemical oxygen demand, Treatment facilities.
Identifiers: *Molecular weight.

Residual organic compounds found in biologically purified waste waters were fractionated by means of gel chromatography on Sephadex columns. The first sample treated was a concentrate of the residual compounds from a laboratory activated sludge unit using a mixture of glucose and glutamic

acid as the substrate; it contained only the compounds produced by the activated sludge microorganisms. Sample 2 was a concentrate of the residual compounds from biologically treated Prague sewage. Sample 3 was a concentrate of trace organic compounds from Prague tap water, which were not removed by the coagulation process in the water treatment plant. Six percent of the compounds in the first sample had molecular weights (MW) greater than 50,000, and 78% had MW lower than 700. Sample 2 contained no compounds with MW above 50,000, 5% compounds with MW between 10,000 and 50,000, and 77% compounds with MW below 700. Thirteen percent of the compounds in sample 3 had MW between 10,000 and 50,000, and 77% had MW below 700. Previous conclusions are discussed in the light of these findings. Coagulation tests verified the theoretical conclusion that, since about 75% of the residual organic compounds have MW below 700, they cannot be removed from the solution by the usual coagulation process. The maximum chemical oxygen demand (COD) removal for various samples varied between 23% and 29%. (See also W76-10515) (Snyder-FIRL)
W76-10514

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS. IX. ISOLATION FROM WATER, FRACTIONATION ON ALUMINUM OXIDE COLUMNS AND ATTEMPTS OF IDENTIFICATION (ZBYTKOVE LATSY PO AKTIVACNIM PROCESU. IX. IZOLACE Z VODNEHO PROSTREDI, DELENI NA KYSLICNIKU HLINITEM A POKUSY O IDENTIFIKACI),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
J. Chudoba, F. Tucek, P. Lischke, A. Dousa, and V. Kubelka.
Scientific Papers of the Institute of Chemical Technology, Prague, F 19 (1974) Technology of Water. 8 fig, 16 tab, 44 ref.

Descriptors: *Waste water treatment, *Pollutant identification, *Activated sludge, *Analytical techniques, *Chemical oxygen demand, Organic matter, Effluents, Organic compounds, Gas chromatography, Mass spectrometry.

Residual organic compounds prepared in a laboratory activated sludge unit fed with glutanic acid and glucose were concentrated, separated from inorganic salts, and fractionated on aluminum oxide columns. Individual compounds were identified by examining fractionated groups using a gas chromatograph-mass spectrometer technique. Sixty-five percent of the chemical oxygen demand (COD) was adsorbed from the effluent of the activated sludge unit when desalination was carried out using a strongly acidic cation-exchange resin and a weakly basic anion-exchange resin. When inorganic compounds were precipitated with ethanol and an ethanol and acetone mixture, 61% of the COD entered the precipitate. The extract obtained with ether after the first desalination was shown by fractionation to contain at least five compounds. The main portion of the compounds not extractable by ether was fractionated by gradient elution and contained 14 groups of compounds. At least three compounds were obtained by combining and refractionating the lesser polar compounds. Only the samples extracted with ether could be analyzed by gas chromatography-mass spectrometry, because the other samples contained nonvolatile compounds. Four derivatives of benzothiazole substituted in the position 2, benzothiofene and its two derivatives, indanone, difenylamine, di-N-probylaniline, nitrophenoles, methylisopropyl phenole, and several other compounds with uncertain structures were identified on the basis of mass spectra. Residual organic compounds originating as waste products of activated sludge microorganisms represent a varied mixture, from less polar to highly polar. (See also W76-10514) (Snyder-FIRL)
W76-10515

DETERMINATION OF 14C-DDT RADIOACTIVITY IN SEA WATER AND MARINE SUSPENDED MATTER BY LIQUID SCINTILLATION,
Institut Rudjer Boskovic, Zagreb (Yugoslavia).
N. Picer, M. Picer, and P. Strohal.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 5, 1 tab., 3 fig., 6 ref. p. 565-570, 1975.

Descriptors: Methodology, *Analytical techniques, *Sea water, *Suspended solids, *Pollutant identification, *DDT, Laboratory tests, Technology, Research and development, *Carbon radioisotopes, Pesticide residues, Pesticides, Chlorinated hydrocarbon pesticides, Carbon.
Identifiers: *Liquid scintillation, Instagel, Tritone.

A method for determining 14C-DDT radioactivity by liquid scintillation is presented. The instagel scintillator showed higher efficiencies in the presence of solid particles in seawater medium than the previously used Tritone scintillator. The content of water in the samples must be relatively high, to insure good detection of 14C-DDT with the Instagel method. (Katz)
W76-10518

PHYSICAL AND CHEMICAL PROPERTIES OF OUTDOOR BEEF CATTLE FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Inst. of Agriculture and Natural Resource.
For primary bibliographic entry see Field 5B.
W76-10543

SAMPLERS FOR MONITORING RUNOFF WATERS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
H. L. Manges, and C. C. Nixon.
Presented at the 1975 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 15-18, 1975, Paper No. 75-2562, 10 p. 4 fig, 9 ref.

Descriptors: *Agricultural runoff, *Sampling, Equipment, *Design, *Performance, Monitoring, Pollutant identification, Farm wastes.

A proportional sampler using short tubes to divide runoff flow was designed, built and tested. In laboratory tests, sampling ratio became constant after decreasing with increasing flow rates for unsubmerged flow and was constant for submerged flow. Sampling ratio was quite variable during field testing due to debris clogging the reservoir below the short tubes. A sampler using orifices surrounded by short tubes in place of the short tubes alone for dividing flow had a slightly better sampling ratio for unsubmerged flow and a constant sampling ratio for submerged flow. Additional research and development is needed to perfect the design and construction of the proportional sampler. However, it has the potential for wide use in runoff monitoring when perfected. (Merryman-East Central)
W76-10550

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-10579

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
W. D. Haseman, C. Holsapple, and A. B. Whinston.
Socio-Economic Planning Sciences, Vol. 10, No. 1, p. 31-36, 1976. 4 fig., 17 ref.

Descriptors: *Data storage and retrieval, *Water quality control, *Computer programs, *Planning, *Management, Monitoring, *Pollutant identification, Data collections.
Identifiers: Generalized Planning System, FORTRAN.

The capabilities, storage adjustments, and retrieval of the Generalized Planning System (GPLAN), its application to the National Pollutant Discharge Elimination System (NPDES), and its implementation of a state permit monitoring program are described. The information system reflects the economic, technical, environmental, and social interdependence of meeting water quality objectives and is designed with particular emphasis as an aid to planning in addition to the functions of monitoring and logistics. The overall structure of the GPLAN system consists of the following major components: (a) Data management system, (b) collection of application programs, and (c) high level query language, each of which are coordinated by a control program, directing the access of data from the data base and the execution of application programs to satisfy the request entered through the query language. To meet the flexibility to the selectivity and the configuration of data retrieval by a planner, the GPLAN query language allows both selective and unconditional retrieval without requiring the planner to be a computer specialist. The planner can receive the results of the execution of a large scale application program, e.g., optimization/simulations, using the required data from the data base as input. FORTRAN is the host language and the system implementation language. (Auen-Wisconsin).
W76-10588

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 5B.
W76-10607

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
For primary bibliographic entry see Field 5G.
W76-10623

REPORT ON POLLUTION OF INTERSTATE WATERS OF THE CONNECTICUT RIVER.
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-245 744, $4.50 in paper copy, $3.00 in microfiche. November, 1963, 65 p, 6 fig, 5 tab, 1 append.

Descriptors: *Pollutant identification, *Sewerage, *Sewage, *Water quality, Natural streams, Industrial wastes, Tributaries, Degradation(Stream), Downstream, Impounded waters, Rivers, *Connecticut River, Solid wastes, Water pollution sources, Massachusetts.

Pollution of interstate waters of the Connecticut River is reported, based on previous reports, official Public Health Service records, and data from a field study in September and October 1963. Various state and local agencies and individuals also provided data and information. Both river water and sewage were sampled and analyzed. Sixty-two miles of the river, from Hatfield, Massachusetts, to 12 miles below Hartford, Connecticut, were studied, as were portions of the Chicopee and West-

field rivers, tributaries of the Connecticut River near Springfield, Massachusetts. Two dams on the Connecticut River and several small dams on the other two rivers provide hydroelectric power and industrial process water. The river receives raw and partially treated sewage from a population of 750,000 and industrial discharges equivalent to raw sewage from a population of 100,000. As a result, it is excessively polluted. In 1963, bacterial quality of the water did not meet common water pollution control objectives at any point on the river. The suspended solids produced sludge deposits from a short distance below Holyoke Dam to Enfield Dam. Dissolved oxygen was intermittently depleted below the desirable level by the oxygen demand of the decomposing wastes. Visual evidence of pollution included cloudy water near discharges, intermittent dye colors from industrial wastes, small grease balls, bits of excreta near sewage discharges, and intermittent oil films. Wastes discharged into these rivers in Massachusetts endanger Connecticut residents' health and welfare, and are therefore subject to abatement under the Federal Water Pollution Control Act. (Snyder-FIRL)
W76-10626

CHARACTERIZATION OF SULFIDE MINERAL SURFACES IN FROTH FLOTATION SYSTEMS USING ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS,
Missouri Univ., Rolla. Dept. of Metallurgical and Nuclear Engineering.
For primary bibliographic entry see Field 5D.
W76-10635

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
September 14-19, 1975, Las Vegas, Nevada, (500 p). A Joint Conference of the International Symposium on Environmental Monitoring and the Third Joint Conference on Sensing of Environmental Pollutants.

Descriptors: *Monitoring, *Analytical methods, *Legal aspects, *Water quality, *Pollutant identification, Flow, Surface waters, Groundwater, Oceans, Estuaries, Network design, Waste disposal, Equipment, *Conferences.

More than 200 conference papers dealing with topics related to environmental sensing and assessment techniques are presented, with 57 of the presentations dealing with water resources. Topics covered include: surface-groundwater relationships; groundwater contamination; estuarine circulation; the identification of water pollutants; pollutant pathways in ground, surface, and coastal waters; the effects of pollutants on water uses; waste treatment and disposal processes; water quality control; methods for evaluating monitoring projects; the legal aspects of monitoring aquatic environments; the design of monitoring networks; remote sensing techniques; collection and sample preparation methods; laboratory analytical methods; and field monitoring devices. (See W76-10638 thru W76-10672) (Kreager-FIRL)
W76-10637

FLOW OF TOXIC METALS IN THE ENVIRONMENT,
Pan American Health Organization, Mexico City.
For primary bibliographic entry see Field 5B.
W76-10638

SAMPLING AND ANALYSIS OF METALS IN AIR, WATER AND WASTE PRODUCTS,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Environmental Engineering Science.
J. J. Morgan.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 1-2-1 - 1-2-9, 4 tab, 83 ref.

Descriptors: *Pollutant identification, *Metals, *Sampling, *Analytical techniques, Neutron activation analysis, X-ray fluorescence, Mass spectrometry, Potable water, Surface waters, Sewage, Sludge, Aquatic life.
Identifiers: Atomic absorption spectrometry, Plasma emission spectrometry.

Monitoring, sampling, and analytical procedures for different environmental compartments are reviewed from the standpoint of source-flow-receptor and chemical element balance concepts. Levels of various metals in drinking water, surface waters, sewage effluent, and sewage sludge are compared. Standard, tentative, and approved analytical methods are reviewed for the analysis of metals in water along with methods for collection, preconcentration, and sample preparation. The effects of sampling, storage, processing, and preconcentration steps on the overall analysis of water samples containing metals are also discussed. Analytical methods such as instrumental neutron activation analysis, X-ray fluorescence, flame and non-flame atomic absorption, plasma emission spectrometry, and spark source mass spectrometry are reviewed in terms of their accuracy and range of use. The need for advancements in chemical speciation is discussed in terms of the effects of particular metals on aquatic life. (See also W76-10637) (Kreager-FIRL)
W76-10639

MONITORING: THE TRIGGER FOR ACTION,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
I. E. Wallen.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 2-1-1 - 2-1-3.

Descriptors: *Monitoring, Programs, *Water quality, *Pollutant identification, *Water treatment, Chlorination, Industrial wastes, Potable water, Organic compounds, Asbestos, Inorganic compounds, Chemical reactions, Standards, Surveys.
Identifiers: Halogenated organics, Halomethanes.

Environmental Protection Agency air and water monitoring programs are reviewed. The programs include the monitoring of drinking water for organics that are suspected carcinogens, the monitoring of industrial waste waters for asbestos, early warning efforts to screen water samples from industrial areas for toxic organic and inorganic compounds, and a project to identify multimedia exposure to selected halogenated organics in air, water, soil, and food as well as the levels of these chemicals in human populations throughout an exposure area. A survey of 80 drinking water supplies has already established the possibility that chlorination may be contributing to the formation of halomethanes in drinking water. The use of monitoring data in setting standards is also discussed. (See also W76-10637) (Kreager-FIRL)
W76-10640

ENVIRONMENTAL LEVELS OF PCB'S,
Environmental Protection Agency, Washington, D. C.
D. J. Ruopp, and V. J. DeCarlo.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 2-3-1 - 2-3-5. 1 fig, 4 tab, 35 ref.

Descriptors: *Polychlorinated biphenyls, *Water pollution, *Water pollution effects, *Monitoring, Fish, Pollutant identification, Surveys, Surface waters, Groundwater, Industrial wastes, Sewage, Treatment facilities, Effluents, Human population.

Data from national surveys of environmental levels of polychlorinated biphenyls are presented. Surface water and groundwater levels throughout the United States range from 0.1-4.0 micrograms/liter, and levels in fish range from 0.10-14.8 ppm. On the basis of national aquatic environmental data collected in 1971-1972 and in 1974, a continuing widespread accumulation of polychlorinated biphenyls in water, sediment, and fish appears to be occurring. A human monitoring program in 1972 revealed that 3035 out of 4102 samples of human adipose tissue showed levels ranging from less than one ppm to more than 3 ppm. In 1973, 964 out of 1277 samples from 28 states again showed levels in the same range. The major sources contributing to the environmental levels of polychlorinated biphenyls appear to be industrial effluents, manufacturing processes, consumer and industrial waste materials, sewage treatment facilities, and accidental spills. (See also W76-10637) (Kreager-FIRL)
W76-10641

A PRELIMINARY DESIGN FOR A NATIONAL ENVIRONMENTAL CENSUS,
Energy Resources Co., Inc., Cambridge, Mass.
R. H. Rosen, and R. P. Beck.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-2-1 - 3-2-3. 3 tab, 6 ref.

Descriptors: *Monitoring, *Water quality, *Costs, *Census, Economics, Water pollution control, Evaluation, Projections, Design criteria.
Identifiers: National environmental census.

Present and future requirements for pollution control expenditures in the United States are reviewed, and a national environmental census designed to overcome inadequacies of the present monitoring system is proposed. The capital investment for water pollution control is expected to exceed $80 billion between now and 1982. Although over 5453 water monitoring stations presently exist, which is more than enough to meet the nation's needs, a lack of rational distribution of monitoring facilities is evidenced by the fact that 10 of the 50 states have less than half of the number of monitoring stations required to represent the population. A national environmental census is proposed as a solution to the distribution problem. The census is expected to cost between 68 and 104 million dollars/year for water monitoring. (See also W76-10637) (Kreager-FIRL)
W76-10642

DESIGN OF NATIONWIDE WATER-QUALITY MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
R. J. Pickering, and J. F. Ficke.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-3-1 - 3-3-4. 2 fig, 5 ref.

Descriptors: *Monitoring, *Water quality, *Network design, *Pollutant identification, Groundwater, Surface waters, Rivers, Design criteria, Networks, Biological properties, Organic compounds, Radioactive wastes.
Identifiers: National Stream Quality Accounting Network.

Design criteria for water quality monitoring networks are discussed, and the United States Geological Survey's National Stream Quality Accounting Network is described. Specific objectives of a monitoring program must be defined before a proper mix of sampling sites, frequency of measurement, and characteristics to be measured can be selected. Design of groundwater quality networks, for example, must be based on knowledge of direction and rate of water movement, while proper sampling in streams requires a

knowledge of velocity distribution in the cross section and expected variation in streamflow and water quality with time. A National Stream Quality Accounting Network which subdivides the United States into 325 hydrologic accounting units is being designed by the Geological Survey to provide a measure of the quality of the Nation's rivers. Reports from the network will describe geographic and annual variations in stream flow and water quality, their probable causes, and detectable long-term trends. Organic and radioactive substances and biological characteristics will be measured at selected network stations that constitute subnetworks of the National Stream Quality Accounting Network. (See also W76-10637) (Kreager-FIRL)
W76-10643

SOME INTERNATIONAL ACTIVITIES IN ENVIRONMENTAL MONITORING,
World Health Organization, Geneva (Switzerland).
G. Ozolins.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-4-1 - 3-4-4.

Descriptors: *Monitoring, *Water quality, *International commissions, Programs, International hydrological decade, Potable water, Surface waters, Oceans, Sea water, Irrigation water, Surveys, Hydrology, Fisheries.

A review of international environmental monitoring activities is presented. The World Health Organization is providing direct assistance to less developed countries for the establishment of drinking water surveillance programs and is preparing a training manual for this purpose. The Food and Agriculture Organization is involved in providing technical assistance and guidance on the development of water quality monitoring programs for commercial fisheries and is also pursuing monitoring projects related to agriculture, particularly irrigation waters. The United Nations Educational, Scientific and Cultural Organization is concentrating on the coordination of the International Hydrological Decade and the International Hydrological Program and is preparing a guidebook for water quality surveys. The Intergovernmental Oceanographic Commission, the Intergovernmental Maritime Consultative Organization, and other organizations are involved in studying pollution of oceans and the seas. The World Health Organization is involved in surface water monitoring activities and is giving assistance to Member States in developing national water pollution monitoring programs. The World Meteorological Organization is primarily directing its monitoring activities towards operational hydrology. (See also W76-10637) (Kreager-FIRL)
W76-10644

EARTHWATCH-SENTINEL FOR THE FUTURE,
National Oceanic and Atmospheric Administration, Rockville, Md.
C. E. Jensen, and D. W. Brown.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-5-1 - 3-5-3.

Descriptors: *Monitoring, *Water quality, *Water pollution effects, *Baseline studies, *Environmental effects, Programs, Oceans, Lakes, Hydrology, Data collections, Information exchange, Indicators, Pollutant identification, Fish.
Identifiers: EARTHWATCH.

The global environmental assessment program, EARTHWATCH, is described. This program is part of the United Nations Environment Program and calls for the establishment of World Environmental Assessment Centers and Regional Environmental Assessment Centers which in turn are supported by national facilities. EARTHWATCH Reference Sites are to be established for providing an integrated base of benchmark data and information and will include selections from ongoing and planned activities dealing with hydrology stations, lake biome programs, open ocean baseline sites, and river outflow stations. Impact sites will provide a continuing, systematic appraisal of immediate and nearterm environmental impacts and will include programs dealing with regional marine monitoring activities. An EARTHWATCH Indicator Program will begin with the designation of a series of target substances or organisms to be included in reference and impact monitoring activities. Three pilot projects are also proposed. (See also W76-10637) (Kreager-FIRL)
W76-10645

NETWORK DESIGN CONSIDERATIONS FOR THE GLOBAL ENVIRONMENTAL MONITORING SYSTEM (GEMS) OF THE UNITED NATIONS,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
R. Citron.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 3-6-1 - 3-6-6. 6 tab, 22 ref.

Descriptors: *Monitoring, *Networks, *Water quality, *Pollutant identification, Programs, Heavy metals, Organic compounds, Chemical properties, Biological properties, Potable water, Sea water, Rain, Freshwater, Sewage.
Identifiers: Chlorinated hydrocarbons.

Worldwide existing and planned environmental monitoring programs are surveyed in connection with a Global Environmental Monitoring System being developed by the United Nations. One of the first priorities of the System is to coordinate and support monitoring programs that provide information on the states and trends of global pollution. At least 160 programs operating over 10,000 sites in 44 countries are currently monitoring toxic heavy metals and chlorinated hydrocarbons in air, fresh water, marine water, drinking water, soil, plants, food, animals, and man. More than 50 programs over 3500 sites are monitoring these pollutants in North America. On a worldwide basis, 145 marine water programs, 278 fresh water programs, 48 drinking water programs, 9 rain programs, and 2 sewage programs are operating over 15,837, 32,246, 6440, 232, and 18 sites, respectively, for monitoring the biological and chemical properties of these media. (See also W76-10637) (Kreager-FIRL)
W76-10646

POLYCHLORINATED BIPHENYLS OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W76-10647

WATER CONTAMINATION DETECTION,
Rockwell International, Canoga Park, Calif. Rocketdyne Div.
I. Lysyj.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-2-1 - 4-2-3. 4 tab, 4 ref.

Descriptors: *Analytical techniques, *Water quality, *Organic compounds, *Gas chromatography, *Waste water(Pollution), Surface waters, Feasibility studies, Evaluation, Measurement, Rivers, Effluents, *Pollutant identification.
Identifiers: Pyrographic analysis.

The feasibility of using pyrographic analysis for detecting gross discharges and spills of waste materials into open waters and for monitoring gross changes in the quality of the receiving water was evaluated. Pyrographic analysis involves subjecting the water sample to elevated temperatures so that the organics in the water are pyrolyzed. The pyrolysis gases are then separated by gas chromatography and detected as a series of peaks by a flame ionization detector. A field study in the Occonee River in Georgia demonstrated that pyrographic patterns of discharged waste were different from pyrographic patterns of natural unpolluted waters, providing a means for determining general or gross water quality of a receiving stream. A method of developing a scale of relative septicity as an indicator of gross water quality was also presented. (See also W76-10637) (Kreager-FIRL)
W76-10648

SPARK SOURCE MASS SPECTROMETRY: THE OPTIMUM REFEREE METHOD FOR MULTIELEMENT ANALYSIS,
Environmental Research Lab., Athens, Ga.
C. E. Taylor.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-4-1 - 4-4-2. 2 fig.

Descriptors: *Mass spectrometry, *Pollutant identification, *Water quality, *Analytical methods, X-ray fluorescence, Neutron activation analysis, Measurement, Performance, Evaluation.
Identifiers: Multi-element analysis, Trace analysis, Atomic absorption spectrometry, Plasma emission spectrometry.

The use of spark source mass spectrometry for the multielement analysis of water samples is discussed. The method can be used to routinely yield data on up to 82 elements simultaneously at the parts per billion level. The operating parameters for the instrumentation are constant for all samples, thus eliminating the need for optimization procedures. A comparison of spark source mass spectrometric analyses with those of instrumental neutron activation analysis, plasma emission, atomic absorption, and X-ray fluorescence revealed unexpected errors in the latter methods associated with the complex and variable matrices of environmental samples. (See also W76-10637) (Kreager-FIRL)
W76-10649

FREQUENCY DISTRIBUTIONS FOR COLIFORM BACTERIA IN WATER,
Drexel Univ., Philadelphia, Pa. Dept. of Environmental Engineering and Science.
W. O. Pipes, P. Ward, and S. H. Ahn.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-5-1 - 4-5-5. 4 fig, 1 tab, 7 ref.

Descriptors: *Coliforms, *Waste water(Pollution), *Statistical models, *Statistical methods, *Fermentation, Evaluation, Measurement, *Pollutant identification, Mathematical studies, Water treatment.
Identifiers: Bacterial counts, Poisson distribution, Binomial distribution, Multiple tube fermentation tests.

Data from multiple fermentation coliform counts on raw water from a water treatment plant were analyzed to determine the best fit statistical frequency distribution. The data for each of five runs fit a negative binomial distribution and did not fit a Poisson distribution which had been assumed to be valid for coliform counts. Thus, the use of the Poisson distribution to represent coliform counts appears to lead to an underestimate of the variability of these counts, and the calculation of the most probable number values from multiple tube fermentation tests leads to underestimates of mean coliform densities. (See also W76-10637) (Kreager-FIRL)
W76-10650

TRACE METAL ANALYSIS BY ATOMIC EMISSION USING A D.C. ARGON PLASMA,
Naval Underwater System Center, Newport, R. I. Material and Chemistry Branch.
W. G. Cox.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-6-1 - 4-6-4. 2 fig, 12 ref.

Descriptors: *Spectrophotometry, *Argon, *Analytical techniques, *Pollutant identification, *Metals, Water quality, Sea water, Mercury, Lead, Cadmium, Zinc, Copper, Chromium, Costs, Evaluation, Performance, Measurement.
Identifiers: Atomic emission spectrometry, Plasma atomic emission spectrometry.

The use of direct current argon plasma atomic emission spectrometry for the analysis of trace metals in water samples is discussed. The method utilizes an Echelle grating spectrometer with a direct current argon plasma to achieve high resolution, high luminosity, and wide spectral coverage. Matrix effects which have traditionally plagued atomic absorption techniques are minimized or eliminated. Calculated detection limits for mercury, lead, cadmium, zinc, copper, and chromium in sea water samples were 57, 35, 12, 12, 6 and 8 micrograms/liter, respectively, using the argon plasma atomic emission technique. The overall acquisition and maintenance costs of the system are comparable to those for an atomic absorption system. (See also W76-10637) (Kreager-FIRL)
W76-10651

AN EVALUATION OF AUTOMATIC WASTEWATER COMPOSITORS,
Environmental Protection Agency, Kansas City, Kans. Surveillance and Analysis Div.
D. J. Harris, and W. J. Keffer.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-7-1 - 4-7-5. 3 tab, 2 ref.

Descriptors: *Sampling, Equipment, *Waste water(Pollution), *Monitoring, *On-site tests, Evaluation, Performance, Treatment facilities, Waste water treatment, Instrumentation, Municipal wastes, Sewage treatment, *Pollutant identification.

Results from field evaluations of automatic waste water samplers are presented, and field compliance monitoring procedures used by the Environmental Protection Agency are reviewed. Comparison studies of various commercial waste water samplers at four sewage treatment plants indicated variations in water chemistry data which were greater than could be explained by laboratory analytical error. Samplers which produced the highest concentrations of solids had higher liquid intake velocities. Slower acting peristaltic and piston pump type samplers appeared to be either not capturing settleable materials or were exhibiting higher settling velocities than liquid intake velocities after introduction to the intake line. High vacuum sampling equipment is used by the Environmental Protection Agency on waste sources with appreciable concentrations of large and/or heavy settleable material such as raw municipal waste water since this type of sampling equipment appears to produce more representative samples. (See also W76-10637) (Kreager-FIRL)
W76-10652

SOME CONSIDERATIONS ON MONITORING OF TRACE METALS IN ESTUARIES AND OCEANS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
D. A. Segar, and A. Y. Cantillo.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 6-5-1 - 6-5-5. 3 fig, 1 tab, 13 ref.

Descriptors: *Metals, *Estuary, *Oceans, *Pollutant identification, *Analytical techniques, Sampling, Rivers, Sewage sludge, Dredging, Zinc, Copper, Iron, Separation techniques, Coasts, New York, New Jersey.
Identifiers: Atomic absorption spectrophotometry, Bights, Dredge spoil dumping.

The trace metal chemistry of the coastal waters of New York and New Jersey in the vicinity of the Hudson-Raritan river discharge was studied. Contamination-free samples were obtained using a 'top drop' Niskin bottle and a rosette multi-sampler. Analysis was performed by flameless atomic absorption spectrophotometry. Large geographical and short-term temporal variations in dissolved trace metal content were observed. Intensive sampling in a restricted geographical area also revealed the existence of coherent cells of water which contained anomalously high metal concentrations. The geographical location of these cells suggested that they were caused by the river discharge influence and by sewage sludge or dredge spoil dumping. An appreciable fraction of the metal present in the dissolved phase of the New York Bight could not be determined by traditional analytical techniques such as solvent extraction. Continuous real-time horizontal profiling of trace metal concentrations from a moving vessel apears to be required for adequately describing the processes affecting metal introduction, transport, and removal in the area. Data on the percentage of total dissolved copper and iron which is determinable by solvent extraction and atomic absorption are presented along with vertical distributions of total zinc. (See also W76-10637) (Kreager-FIRL)
W76-10653

ENVIRONMENTAL MONITORING IN LATIN AMERICA AND THE CARIBBEAN,
Pan American Health Organization, Washington, D. C.
R. Haddad, and W. Castagnino.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 8-1-1 - 8-1-7. 4 fig, 5 tab, 13 ref.

Descriptors: *Monitoring, *Water quality, *Pollutant identification, *Rivers, *Model studies, Dissolved oxygen, Biochemical oxygen demand, Coliforms, Bacteria, Solid wastes, South America.
Identifiers: *Latin America, *Caribbean.

Water pollution monitoring activities in Latin America and the Caribbean are reviewed. Most countries in the region have been collecting water quality information for several decades with varying degrees of coverage. An example of studies being performed to evaluate basin-wide water quality is the Pan American Health Organization report on 'Water Quality in the Plata River Basin.' This study includes monitoring of dissolved oxygen, biochemical oxygen demand, and coliform level in the Matanza River (Buenos Aires area); assessing the influence of Bermejo River solid load discharge into the Parana River system; and bacterial pollution monitoring in the Guaiba River (Porto Alegre area). Studies designed to predict future water quality and the degree of pollution control required for meeting specific socio-economic needs are also being conducted. An example is the Guanabara Bay modelling effort and its monitoring requirements. (See also W76-10637) (Kreager-FIRL)
W76-10654

ENVIRONMENTAL QUALITY SURVEILLANCE IN INDONESIA,
National Inst. of Health, Research and Development, Djakarta (Indonesia).
S. S. Soesanto.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 8-7-1 - 8-7-4. 1 tab 1 ref.

Descriptors: *Monitoring, *Water quality, *Pollutant identification, *Industrial wastes, Waste water treatment, Treatment facilities, Rivers, Coasts, Biochemical oxygen demand, Dissolved oxygen, Bacteria, Saline water intrusion, Sea water, Reservoirs.
Identifiers: *Indonesia.

Water quality monitoring data are presented for indonesia. River and storm water canals in Jakarta show biochemical oxygen demand levels ranging from 100-200 ppm; dissolved oxygen often drops to 0 ppm. An assessment o of the bacteriological quality of raw water taken from the storm water canal for the Jakarta Water Treatment Plants shows a mean probability number of 500,000-2,000,000/100 ml. Biochemical oxygen demand values as high as 1000 ppm exist in the Pluit reservoir, it is located near the sea where industrial waste is discharged. Saline water intrusion is a problem in some coastal area such as the northern coast of Java and the southern coast of Kalimantan. Water pollution from fertilizer plant wastes exists in South Sumatera, and East Java is experiencing water pollution problems as a result of petrochemical wastes. (See also W76-10637) (Kreager-FIRL)
W76-10655

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 5G.
W76-10656

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-10657

DEVELOPMENT OF A METHODOLOGY FOR MONITORING GROUNDWATER QUALITY,
California Univ., Berkeley.
D. K. Todd, and L. G. Everett.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-3-1 - 9-3-4.

Descriptors: *Monitoring, *Groundwater, *Water quality, *Pollutant identification, Data collections, Programs, Network design, Measurement, Water pollution, *Methodology.

A chronological procedure for implementing a groundwater quality monitoring program is presented. The approach is general so that it can be applied in a local area under a variety of land use and hydrogeologic conditions. The implementation procedure consists of the following steps: selection of the area or basin to be monitored, definition of groundwater usage, identification of pollution sources and causes, definition of the hydrogeologic situation, studies of existing groundwater quality, prioritization of pollution sources and causes, evaluation of existing monitoring programs, identification of alternative monitoring approaches, selection and implementation of the monitoring program, review and interpretation of the monitoring results, and summarization and transmittal of monitoring information. (See also W76-10637) (Kreager-FIRL)
W76-10658

MONITORING GROUNDWATER POLLUTION,
K. D. Schmidt.

In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-4-1 - 9-4-6. 25 ref.

Descriptors: *Groundwater, *Monitoring, *Wells, *Aquifers, *Soils, Infiltration, Groundwater movement, Infiltration rates, Soil water movement, Soil properties, Water quality, *Pollutant identification, Bacteria, Inorganic compounds, Subsurface waters, Sampling, Percolation, Water table, Water pollution.

Procedures for the monitoring of groundwater pollution are outlined. Groundwater pollution monitoring entails source monitoring, evaluation of infiltration potential, monitoring in the topsoil and vadose zone, and aquifer monitoring. The most important aspect of groundwater pollution monitoring is in water well sampling. If existing wells are not sufficient, specially designed monitoring wells may have to be constructed. Source monitoring also includes inventorying and sampling solid and liquid wastes which may eventually percolate to the water table. Waste disposal methods partly determine infiltration potential and whether or not portions of the soil-groundwater system are being bypassed. In general, major inorganic constituents are the most mobile in soil-groundwater systems, and bacteriological pollutants are the least mobile. Time trends and the three-dimensional distribution of groundwater quality must be evaluated to successfully monitor aquifer pollution. (See also W76-10637) (Kreager-FIRL)
W76-10659

MANAGEMENT OF GROUNDWATER QUALITY DATA,
Commonwealth Associates, Inc., Jackson, Mich.
N. F. Hampton.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-5-1 - 9-5-5. 1 tab, 5 ref.

Descriptors: *Groundwater, *Water quality, *Data collections, *Computer programs, *Data storage and retrieval, Data processing, Computers, Subsurface waters, Management, Water pollution.

Elements necessary for the efficient management of a groundwater quality data base are outlined. A comprehensive groundwater management information system must be capable of maintaining the following types of data: station descriptions, water quality criteria, geologic information, hydrologic information, water quality parameter identifiers, water quality measurements, temporal information, information qualification data, monitoring agency status data, and information indexing. Primary factors considered in selecting data collection systems are purchase and operating cost, reliability, responsiveness, and minimizing bottlenecks created by relatively high internal computer processing speeds and low input speeds. User access to groundwater surveillance data should be in the batch mode, whereas access to the information index system component should be in the real-time mode. The development of the data storage component of the system entails the selection of hardware devices, data organization schemes, and data base management software packages. Computerized data processing is accomplished either in batches or on a real-time basis. Real-time processing should be implemented only where rapid system response is needed since batch processing permits more efficient hardware utilization. The data retrieval component of a groundwater data file must yield both alphanumeric and pictorial output. (See also W76-10637) (Kreager-FIRL)
W76-10660

GROUNDWATER POLLUTION MONITORING CASE STUDIES,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-6-1 - 9-6-4. 20 ref.

Descriptors: *Monitoring, *Groundwater, *Aquifers, *Sampling, *Wells, *Pollutant identification, Heavy metals, Organic compounds, Microorganisms, Subsurface waters, Groundwater flow, Tracers, Hydrogeology, Computer models.

Recommendations for groundwater pollution monitoring based on five case studies of aquifer contamination are presented. The following procedures are recommended: establish an interdisciplinary committee at the outset to ensure collection of interrelated quality parameters; examine the hydrogeology of the problem site; ensure that the sampling well network is as dense as possible in the vicinity of the pollution source; use alternative techniques in addition to wells for defining the confines of the pollution plume; establish a thorough regular sampling program in wells and surface water supplies; analyze samples not only for major constituents but also for heavy metals, organic toxins, and microbial concentrations; use tracers for defining the flow of pollution; use predictive computer models of the flow system; monitor in the zone of aeration as well as in the saturated zone, particularly when the former is of considerable thickness and when perching layers may develop; develop innovative or specialized monitoring techniques when necessary; and continue monitoring until the problem has been quantified. (See also W76-10637) (Kreager-FIRL)
W76-10661

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5D.
W76-10662

POLLUTIONAL EFFECTS OF SUSPENDED, SEDIMENTED AND ERODED PARTICULATE MATERIAL IN THE AQUEOUS ENVIRONMENT,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5C.
W76-10663

AUTOMATED FORECAST PROCEDURES FOR RIVER QUALITY MANAGEMENT,
D. A. Dunsmore, and R. J. Boes.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 14-6-1 - 14-6-5. 2 fig. EPA 16090 DHX.

Descriptors: *Model studies, *Ohio river, *Water quality, *Forecasting, *Automation, Monitoring, Surface waters, Dissolved oxygen, Chlorides, Water management(Applied), Rivers, Computer programs.

A dynamic water quality model designed for use in conjunction with a robot monitor network in the Ohio River Basin is described. The model, which is known as STREAM, is both time and event dependent and operates on the basis of appropriate river geometry definitions in conjunction with waste load discharge data. Depending on the modeling objective, the model may accept any combination of constant or dynamically variable data to model travel time, river temperature, dissolved oxygen, conductivity, and chloride in one of three operational modes available. Additional variables may be modeled by means of optional user exits and a user data bank. A free form of input combined with the availability of a command structured dictionary allows individuals with little computer expertise to operate the model efficiently. The model is being used to supplement water quality management activities throughout the Ohio River and is part of an automated pollution forecasting system. (See also W76-10637) (Kreager-FIRL)
W76-10664

A STRATEGY FOR AQUATIC POLLUTANTS FATE AND TRANSPORT DETERMINATION,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W76-10665

REMOTE SENSING OF GROUND AND SURFACE WATER CONTAMINATION BY LEACHATE FROM LANDFILL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
D. A. Sangrey, W. L. Teng, W. R. Philipson, and T. Liang.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-1-1 - 15-1-5. 2 fig, 2 tab, 2 ref.

Descriptors: *Remote sensing, *Aerial photography, *Infrared radiation, Water pollution, *Landfills, *Leachate, On-site investigations, Feasibility studies, Evaluation, Performance, Photography, Analytical techniques, Groundwater, Surface waters, *Pollutant identification.
Identifiers: Thermal infrared imagery.

The feasibility of using remote sensing procedures for detecting and evaluating ground and surface water contamination by landfill leachate was evaluated at 15 landfill sites in central New York. Aircraft flights and ground sampling were performed at key times during a one-year period, and the aerial data included color and color infrared photography and thermal infrared imagery. Each type of remote sensing proved to be useful to some extent, and the combination of color and color infrared photography was the most effective system. Wetness, discoloration of land and surface waters, and vegetative stress were useful ground characteristics imaged by the remote sensors. In no case were they uniquely indicative of leachate; however, in association with landfill, they defined prime areas for more detailed study and ground level confirmation. No methods were found for quantitatively defining leachate. Remote sensing was most effective during wet periods in early spring. (See also W76-10637) (Kreager-FIRL)
W76-10666

LAND DISPOSAL OF WASTES: POTENTIAL FOR GROUNDWATER POLLUTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10667

A PROPOSED NATIONAL MONITORING SYSTEM FOR ORGANICS IN WATER,
Environmental Research Lab., Athens, Ga.
J. M. McGuire.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-4-1 - 15-4-4. 4 fig, 1 tab, 6 ref.

Descriptors: *Organic compounds, *Gas chromatography, *Mass spectrometry, Computers, *Pollutant identification, *Water quality, Industrial wastes, Effluents, Data collections, Data storage and retrieval, Monitoring, Analytical techniques.

A computerized gas chromatographic/mass spectrometric technique is proposed for use in a national monitoring system for identifying organics in natural water and industrial effluents. The

system combines the separation capability of gas chromatography with the detection capability of mass spectrometry. A combination of the techniques results in a mass spectrum of each peak as it elutes from the gas chromatograph, thus providing a 'fingerprint' of the organic compounds in a sample. Computerization can be used to shorten the time required for spectral interpretation and compound identification. Other refinements include record-keeping programs to provide statistics on how frequently a given compound is identified, where particular compounds are identified, and how often the same unidentified spectrum is encountered. Currently, a data base of over 35,000 reference spectra exists. (See also W76-10637) (Kreager-FIRL)
W76-10668

CAPABILITIES AND LIMITATIONS IN IDENTIFYING AND MEASURING AQUATIC POLLUTANTS,
Environmental Research Lab., Athens, Ga.
W. T. Donaldson.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-5-1 - 15-5-3. 13 ref.

Descriptors: *Pollutant identification, *Potable water, *Organic compounds, *Gas chromatography, *Mass spectrometry, *X-ray fluorescence, *Nuclear magnetic resonance, Analytical techniques, Infrared radiation, Evaluation, *Measurement.
Identifiers: Fourier transform infrared spectroscopy, Raman spectroscopy, Multi-element analysis, Freeze concentration, Low-temperature distillation, Ion exchange liquid chromatography, Plasma emission spectrometry.

Methods for the qualitative organic analysis and multi-element analysis of water samples, particularly drinking water, are discussed in terms of their present capabilities and limitations. Gas chromatography-mass spectrometry with computerized data interpretation allows for the identification of extractable, volatile organic compounds; but identification of polar and high molecular weight compounds is not possible by this method. Freeze concentration, low-temperature distillation, and high-pressure ion exchange liquid chromatography show some promise for the identification of polar compounds. Atmospheric pressure ionization mass spectrometry, Fourier transform infrared spectroscopy, Raman spectroscopy, and nuclear magnetic resonance spectrometry offer some hope for identifying high molecular weight compounds. For multi-element analyses, spark source mass spectrometry is capable of measuring simultaneously up to 82 elements at concentrations as low as one microgram/liter; however, this method is slow and expensive and requires a highly skilled analyst to operate the instrument. X-ray fluorescence and inductively coupled plasma emission spectrometry show promise for overcoming most of these shortcomings. (See also W76-10637) (Kreager-FIRL)
W76-10669

ASSESSMENT OF THE BENEFITS OF ENVIRONMENTAL REMOTE SENSING,
Enviro Control, Inc., Rockville, Md.
A. Hershaft.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 16-1-1 - 16-1-6. 1 tab.

Descriptors: *Remote sensing, *Water quality, *Monitoring, *Water management(Applied), Analytical techniques, Estuaries, Lakes, Oceans, Coasts, Eutrophication, Surface waters, Water pollution, Sediments, Sedimentation, Waste disposal, Hydrology.

Benefits accruing from the use of remote sensing in environmental monitoring are analyzed using a case study designed to assess the benefits of data supplied by a continuing Earth Resources Survey mission in the 1977-1986 time frame. Demand for water quality data is estimated on the basis of the legislative climate, interviews with potential users, and the projected amount of data required. Promising applications in the area of water quality management include: the detection of sediment discharges from non-point sources to assist in establishing waste load allocations in large water bodies, the delineation of dispersion patterns from offshore dumps, and the characterization of long-term trends in sedimentation and eutrophication of large water bodies. Remote sensing also appears to be useful in characterizing hydrologic circulation patterns and in determining water quality trends in large lakes, estuaries, and offshore waters. In general, remote sensing appears to be of value in complementing rather than replacing in situ monitoring data. (See also W76-10637) (Kreager-FIRL)
W76-10670

MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH,
IIT Electro-Physics Lab., Inc., Columbia, Md.
V. Klemas, G. Davis, H. Wang, W. Whelan, and G. Tornatore.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 16-2-1 - 16-2-10. 14 fig, 1 tab, 11 ref.

Descriptors: *Monitoring, *Dispersion, *Wastes, *Circulation, *Tracking techniques, *Tracers, *Remote sensing, Oceans, Estuaries, Sediments, Currents(Water), Satellites(Artificial), Aircraft, Oil spills.
Identifiers: Drogues.

An integrated satellite-aircraft-drogue approach for monitoring ocean waste dispersion and estuarine circulation is described. The approach employs remotely tracked expendable drogues together with satellite and aircraft observations of waste plumes and tracers such as suspended sediment or dye. The use of drogues tracking currents at various selected depths complements satellite imaging which is unable to determine current magnitude and to penetrate beyond the upper few meters of the water column. Since in turbid coastal regions suspended sediment acts as a natural tracer, cost is minimized by eliminating the need for expensive injections of large volumes of dye. Tests conducted on the Continental Shelf and in Delaware Bay indicate that the system can provide an effective means of studying current circulation, oil slick movement, and ocean waste dispersion even under severe environmental conditions. By combining the wide coverage of a satellite with aircraft or shore stations capable of tracking expendable drogues, a cost-effective, integrated monitoring system is achieved. (See also W76-10637) (Kreager-FIRL)
W76-10671

EVALUATION OF WATER SAMPLES COLLECTED DURING LANDSAT-1 OVERPASSES OF THE LOWER CHESAPEAKE BAY AREA,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
D. E. Bowker, and W. G. Witte.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 16-3-1 - 16-3-5. 8 fig, 8 tab, 1 ref.

Descriptors: *Remote sensing, *Satellites, *Chesapeake Bay, *Sediments, *Chlorophyll, Monitoring, Statistical methods, Sampling, Water quality, *Pollutant identification, Evaluation.
Identifiers: LANDSAT.

Water samples which were collected on 18 days when the LANDSAT-1 satellite was passing over the lower Chesapeake Bay area were analyzed and compared with MSS radiance values obtained from the satellite. An analysis of the radiance values revealed a low correlation with chlorophyll content and a good correlation with total particulates and sediment. The most consistent correlations were established with sediment; hence, this variable appears to be the most important water parameter for remote sensing surveys with the satellite. A linear relationship was established between sediment and particulates, but the relation varied widely from day to day. Thus, it was not possible to infer the sediment level from the total particle count without a calibration curve. (See also W76-10637) (Kreager-FIRL)
W76-10672

DUMPING SEWAGE SLUDGE IN THE OCEAN.
For primary bibliographic entry see Field 5E.
W76-10674

PESTICIDE INCINERATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5E.
W76-10675

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10718

PCB'S IN THE ENVIRONMENT,
Natural Resources Defense Council, N. Y., New York.
For primary bibliographic entry see Field 5C.
W76-10739

ABUNDANCE AND BIOMASS OF ZOOPLANKTON DURING THE SYNOPTIC INVESTIGATION OF THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA (SOUTH BALTIC) DURING MAY/JUNE, 1972. (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10817

EFFECTS OF THREE EMULSIFYING AGENTS AGAINST CRUDE OIL ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS,
Laboratoire de Physiologie des Etres Marins de l'Institut Oceanographique, Paris, France.
For primary bibliographic entry see Field 5C.
W76-10831

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W76-10832

THE FIBERLOG, A NEW MONITOR FOR FIBROUS EFFLUENTS,
Swedish Forest Products Research Lab., Stockholm.
J. Hill, L. Eriksson, and G. Fladda.
Svensk Papperstidning, Vol. 79, No. 4, p 118-122, 132, March 10, 1976. 9 fig, 3 ref, 2 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Instrumentation, Water pollution sources, Industrial wastes, Wastes, Foreign research, Operation and maintenance, Installation, Equipment, *Monitoring, Measurement, Pollutant identification, Indicator.
Identifiers: *Fiberlog, White water(Paper machines), Sweden.

Both economic and ecological considerations prompt the desire to monitor good fiber contents in white waters and other effluents. The instrument developed at the Swedish Forest Products Research Laboratory sounds a rapid alarm when the good (reusable) fiber level exceeds a predetermined concentration. The apparatus, based on optical principles, has a measuring range extending to 500 mg/liter. Advantages include insensitivity to color changes, to fillers, and to the presence of fines (nonreusable fiber debris). About 25 Fiberlogs are currently in mill operation. Advice on installation and positioning (location) of these monitors is given, and practical experience with their operation is reported. (Brown-IPC)
W76-10843

DETERMINATION OF THE BIOMASS AND DETRITUS CONTENT FROM NATURAL PHYTOPLANKTON SCOOP SAMPLES, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
E. Wittenbrug, and H. Heinrich.
Wiss Z Univ Rostock Mathnaturwiss Reihe 22(10), p 1119-1128, 1973.

Descriptors: *Biomass, *Phytoplankton, *Detritus, Sampling, *Pollutant identificattion, Europe.
Identifiers: Scoop samples, East Germany.

The application of a method, originally intended for use with laboratory cultures, for determining the biomass and detritus in natural scoop samples of phytoplankton taken from the chain of shallow inlets to the south of Darss (East Germany) by the fluorometric in situ determination of DNA and RNA using ethidum bromide is described. The reliability of the data is tested by comparing the data with other parameters (chlorophyll a, protein, dry weight, particulate C and N). The static and dynamic conditions of phytoplankton populations are characterized.--Copyright 1976, Biological Abstracts, Inc.
W76-10864

ATOMIC-ABSORPTION DETERMINATION OF VANADIUM AND MOLYBDENUM IN TAP WATER AND MINERAL WATERS AFTER ANION-EXCHANGE SEPARATION,
Vienna Univ. (Austria). Institut fuer Analytisches Chemie.
J. Korkisch, and H. Krivanec.
Analytica Chimica Acta, Vol. 83, p 111-118, May, 1976. 23 ref, 3 tab.

Descriptors: *Water analysis, *Molybdenum, Anion exchange, Spectroscopy, Analytical techniques, Metals, Trace elements, Water pollution sources, Separation techniques, Ion exchange, Mineral water, Potable water, Heavy metals, *Pollutant identification.
Identifiers: *Vanadium, *Atomic absorption spectrometry.

A method is described for the determination of vanadium and molybdenum in samples of tap and bottled mineral water. After acidification with citric acid the water sample is heated to about 80C to remove carbon dioxide; sodium citrate and ascorbic acid are added and the resulting solution of pH 3 is passed through a column of Dowex 1-X8 (citrate form) on which both vanadium and molybdenum are adsorbed as anionic citrate complexes. Vanadium is eluted with 6 molar HC1; molybdenum is recovered with 2 molar perchloric acid-1 Molar HC1. Vanadium and molybdenum are determined in the eluates by atomic-absorption spectrometry. The samples analyzed contained 0.1-0.9 micrograms/liter of vanadium and 0.2-13 micrograms/liter of molybdenum. (Witt-IPC)
W76-10869

A RAPID METHOD FOR THE SIMULTANEOUS DETERMINATION OF PARAQUAT AND DIQUAT IN POND AND RIVER WATERS BY PYROLYSIS AND GAS CHROMATOGRAPHY,
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
A. J. Cannard, and W. J. Criddle.
The Analyst (The Analytical Journal of The Chemical Society), Vol. 100, No. 1197, p 848-853, December, 1975. 3 fig, 6 ref, 2 tab.

Descriptors: *Herbicides, *Water analysis, *Paraquat, *Diquat, *Gas chromatography, Analytical techniques, Water pollution sources, Halogenated pesticides, Organic compounds, Organic pesticides, Pesticides, Water properties, Water chemistry, Trace elements, *Pollutant identification.
Identifiers: *Pyrolysis.

A method is described for the determination of two widely used herbicides (paraquat and diquat) in aqueous systems. Pyrolysis of the herbicides under carefully controlled conditions, followed by gas-chromatographic analysis of the pyrolyzate, allows detection of the herbicides down to 0.01 ppm. At the lowest concentration levels (0.01-0.1 ppm), there is some loss of linearity of response, possibly due to adsorption of the herbicides on the glass surfaces of the vessels used. This effect may have resulted in substantial errors in previously reported low levels of paraquat and diquat and may also occur in the determination of other ionic herbicides. (Witt-IPC)
W76-10870

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10877

TECHNIQUES DE DETERMINATION RADIDE DES EFFETS DE SYNERGIE RADIONUCLEIDES - POLLUANTS, (TECHNIQUES FOR RAPID DETERMINATION OF EFFECTS OF SYNERGY BETWEEN RADIONUCLIDES AND POLLUTANTS),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
A. Saas, and A. Grauby.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Munich, June 2-5, 1975. IAEA-SM-197/16. p 145-154, 6 fig, 5 ref.

Descriptors: *Radioisotopes, *Pollutant identification, Analytical techniques, *Iodine, Organic wastes.
Identifiers: Synergism.

Several chromatographic techniques for the rapid determination of synergism between radionuclides and various components in water are presented. One of these is concerned with the variation of chemical equilibrium of iodine in the presence of organic and mineral compounds. The second technique makes it possible to define the effects of synergy within a given hydrographic basin. Another technique deals with synergistic effects of groundwater in the presence of various types of irrigation water. The mobility potential of a radionuclide in a given aqueous effluent is defined. (See also W76-09490) (Chilton-ORNL)
W76-10891

CHRONIC TOXICITY OF LINDANE TO SELECTED AQUATIC INVERTEBRATES AND FISHES,
EG and G, Bionomics, Wareham, Mass.
For primary bibliographic entry see Field 5C.
W76-10895

THE TOTAL AEROBIC HETEROTROPHIC BACTERIA GERM CONTENT OF WATER FROM THE SERIES OF SHALLOW INLETS TO THE SOUTH OF DARSS FOUND BY INVESTIGATION USING THE CAST PLATE AND THE MPN METHODS, (IN GERMAN),
H. Westphal, and G. Gubsch.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10); p 1111-1114, 1973.

Descriptors: *Bacteria, Shallow water, Methodology, *Pollutant identification.
Identifiers: *Aerobic bacteria, East Germany, *Heterotrophic bacteria.

Total germ counts were made during regular trips and at 1 permanent station (from May 29-June 2) in the chain of shallow inlets to the S of Darss (East Germany) during 1972 using the cast plate and MPN (most probable number) methods. The 2 methods are compared and discussed.--Copyright 1976, Biological Abstracts, Inc.
W76-10897

COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W76-10898

EFFECTS OF MIREX, METHOXYCHLOR AND MALATHION ON DEVELOPMENT OF CRABS,
Duke Univ., Beaufort, N. C.
For primary bibliographic entry see Field 5C.
W76-10899

ACUTE TOXICITY OF SELECTED TOXICANTS TO SIX SPECIES OF FISH,
Chemico Process Plants Co., El Monte, Calif. Envirogenics Systems.
For primary bibliographic entry see Field 5C.
W76-10900

ATMOSPHERIC EFFECTS OF POLLUTANTS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 45-61. 1 fig, 3 tab, 18 ref.

Descriptors: *Pollutants, *Weather modification, *Atmosphere, *Aerosols, Air pollution effects, Precipitation(Atmospheric), Cloud physics, Clouds, Radiation, Solar radiation, Ozone, Carbon dioxide, Nitrogen compounds, Temperature, Weather, Meteorology.
Identifiers: Inadvertent weather modification.

It was argued that aerosols are probably the principal agents by which pollutants may affect weather and climate. They are most likely to act by influencing the structure and distribution of clouds. On the local scale the effects of pollutants on some aspects of weather are unmistakable. The effects of man-made pollutants on global climate are a matter of debate, but they might already be significant. (See also W76-10901) (Sims-ISWS)
W76-10903

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
P. V. Hobbs.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 63-109. 25 fig, 5 tab, 23 ref. NSF GI-31759.

Descriptors: *Air pollution effects, *Clouds, *Weather modification, *Pulp and paper industry, Industries, Mills, Industrial wastes, Aerosols, Particle size, Cloud physics, Instrumentation, Aircraft, Surveys, On-site investigations, Pollutants, Weather, Meteorology.
Identifiers: Inadvertent weather modification.

Airborne measurements of cloud condensation nuclei (CCN), Aitken nuclei, the size distribution of particles and the microstructure of warm clouds have been made in the vicinity of a large Kraft pulp and paper mill. The plume of CCN and Aitken nuclei from the mill is well-defined at distances up to 40 km downwind, and the concentrations of these particles reach values which exceed those in the polluted air by a factor of about 4. A large secondary maximum in the concentrations of CCN was measured in the plume at a distance downwind of the mill corresponding to a travel time of about four hours. The concentrations of Aitken nuclei in the plume peaked after about two hours of travel time downwind. The particles in the plume were measured over the size range 0.3 to 8 micrometers; their concentrations were much higher than in the unpolluted air, particularly those with diameters less than 1 micrometer. At points downwind in the plume corresponding to travel times greater than about six minutes, a secondary peak appeared in the concentration of particles with diameters just in excess of 0.3 micrometers. It persisted for travel times up to about four hours. (See also W76-10901) (Sims-ISWS)
W76-10904

SOME CHARACTERISTICS OF A DUSTY RAIN IN YUGOSLAVIA,
Yugoslavic Academy of Science and Arts, Zagreb. Inst. for Physics of the Atmosphere.
I. Lisac.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 141-155. 7 fig, 3 tab, 28 ref.

Descriptors: *Dusts, *Rainfall, *Air pollution, *Europe, Chemistry of precipitation, Particle size, Hydrogen ion concentration, Turbidity, Sediments, Sands, Winds, Weather, Sampling, Rain water, Meteorology.
Identifiers: *Dusty rain, *Yugoslavia.

A dusty rain or snow (sometimes called red or yellow rain or snow) and dust-laden winds, mostly at the end of winter or in springtime, is a well known phenomenon in European Mediterranean countries. The yellow-reddish fine dust does not show up every year, but has been observed several times in the last 100 years. In the Croatian capital city of Zagreb, Yugoslavia, rain water acidity measurements are routinely made and the data are available since 1967 for three sites distributed over a broader town area. In the rain water sampled on May 16, 1972, the reddish-yellow fine dust sediment displayed remarkably high pH-values. The samples have been studied and the results were presented. It appears that the dust sediment (particle size less than 0.05 mm) contained particles of domestic origin and particles advected with the tropical air mass originating in African desert area. The dust sediment consisted mostly of small crystals characteristic of desert sand (quartz). The general synoptic situation was suitable for a steady transport of air masses created over the broad NW African continent towards the Apennin and the Balkan peninsula. (See also W76-10901) (Sims-ISWS)
W76-10906

DISPERSION OF POLLUTANTS,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5B.
W76-10907

WIND-TUNNEL SIMULATION OF ATMOSPHERIC FLOW AND DISPERSION,
Colorado State Univ., Fort Collins. Fluid Mechanics Program.
J. E. Cermak.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 189-226. 20 fig, 30 ref.

Descriptors: *Model studies, *Winds, *Air pollution, *Dispersion, Cities, Flow, Pollutants, Wind velocity, Boundary layers, Laboratory tests, Instrumentation, Equipment, Meteorology.
Identifiers: *Model scaling, Wind tunnels, Physical models.

Motion in the atmospheric boundary layer can be simulated with sufficient accuracy to make laboratory studies of air-pollutant transport useful for planning air-pollution control measures. Satisfactory agreement between diffusion characteristics in the simulated and real atmosphere has been found whenever field data have been available for making comparisons. Geometrical scaling on the order of 1:100 is necessary for investigations of air-pollutants in the immediate vicinity of buildings. Pollutant transport over complex terrain may be simulated by using topographic models scaled on the order of 1:10,000, provided that advective transport by the mean surface flow is the dominant transport process. This occurs when a stably stratified atmosphere flows over highly irregular terrain. When the stratification is neutral or unstable, exaggeration of the vertical scale is necessary to preserve dynamic similarity of flow over topographic features. (See also W76-10901) (Sims-ISWS)
W76-10908

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
R. F. Pueschel.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 237-253. 8 fig, 1 tab, 13 ref.

Descriptors: *Aerosols, *Analytical techniques, *Chemical analysis, Nucleation, *Air pollution, Laboratory tests, Particle size, Chemistry, Spectroscopy, X-ray spectroscopy, Measurement, Weather modification, Weather, Cloud physics, Meteorology, *Pollutant identification.
Identifiers: Inadvertent weather modification.

The atmosphere over remote areas of the globe, such as the mid-Pacific, is still unpolluted. Although the turbidity at such locations is affected by occasional volcanic eruptions, no trend is apparent which could be attributed to industrial growth during the past 15 years. The situation is different near population centers. There evidence is found of a deteriorated environmental quality that is in direct proportion to the density of anthropogenic pollution sources. Although commercially available instruments provide valuable information about existing nuclei populations, they do not permit much information about the chemical composition of individual particles. Therefore, a laser spectroscopic particle analyzer has been developed and elemental analysis is performed using a combination of scanning electron microscopy--energy dispersive X-ray analysis. This method of determining the elemental composition of individual aerosol particles enables one to identify man-made aerosols; thus, changes in nuclei concentrations with man's activities can be correlated. (See also W76-10901) (Sims-ISWS)
W76-10910

INTRODUCTION TO THE ATMOSPHERIC AEROSOL SYSTEM,
State Univ. of New York at Albany. Atmospheric Sciences Research Center.
V. A. Mohnen.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 255-274. 7 fig, 1 tab.

Descriptors: *Aerosols, *Atmosphere, *Air pollution, Pollutant identification, Path of pollutants, Particle size, Diffusion, Sedimentation, Water vapor, Rainfall, Precipitation(Atmospheric), Chemistry, Chemical analysis, Gases, Weather modification, Meteorology.
Identifiers: Inadvertent weather modification.

The relationships that exist between, or might connect, the atmospheric aerosol system and inadvertent weather modification are discussed. It included the sources of atmospheric particles, their motions and interaction while in suspension, and their sinks. Man's activity through fossil fuel combustion, agricultural processes, etc., results in an increase of particles of all types and trace gases that enter and participate in the natural cycles. Once all transformation processes and all 'quantities' entering the system are fully known and properly assessed, then a complete system analysis can be made demonstrating the degree of sensitivity of the water cycle to any combination of changes caused by man-made emissions into the atmosphere. (See also W76-10901) (Sims-ISWS)
W76-10911

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
For primary bibliographic entry see Field 3B.
W76-10912

WATER QUALITY CHARACTERISTICS OF THE ILLINOIS RIVER AT PEORIA,
Illinois State Water Survey, Peoria. Water Quality Section.
V. Kothandaraman, and R. A. Sinclair.
Transactions of the Illinois State Academy of Science, Vol. 68, No. 3, p 230-241, September 1975. 4 fig, 6 tab, 7 ref.

Descriptors: *Water quality, *Chemical analysis, *River forecasting, *Mathematical studies, *Illinois, Analytical techniques, Water analysis, Water chemistry, Nutrients, Surface waters, Statistical methods, Regression analysis, Mathematical models, Equations, Rivers, Seasonal.
Identifiers: *Illinois River, Peoria(Ill), Stream standards, Dissolved minerals.

Weekly data on chemical quality characteristics of the Illinois River at Peoria were summarized. Apart from the seasonality in temperature and river flows, distinctive seasonal changes were observed in dissolved oxygen, ammonia, and silica. A comparison of the river water quality with the stream standards adopted by the Illinois Pollution Control Board was presented. The interrelationships among the observed water quality characteristics were evaluated by the stepwise linear regression method. (Henley - ISWS)
W76-10922

A COMPARISON OF SEVERAL WATER QUALITY INDEXES,
CACI, Inc., Reston, Va. Information Technology Dept.
J. M. Landwehr, and R. A. Deininger.
Journal of the Water Pollution Control Federation, Vol. 48, No. 5, p 954-958, May 1976. 6 tab, 7 ref.

Descriptors: *Chemical properties, *Physical properties, *Water quality, Water properties,

*Environmental effects, Biochemical oxygen demand, Dissolved oxygen, Dissolved solids, Hydrogen ion concentration, Temperature, Turbidity, Nitrates, Phosphates, Chemical analysis, Water quality standards, Chemistry, Coliforms, Pollutant identification.
Identifiers: *Water quality indexes, *Arithmetic water quality index, *Multiplicative index, *Harkins' index, Indexes, Fecal coliform count, Mineral constituents.

The purpose is to compare several water quality indexes that have been recently developed. Five different water quality indexes were considered. The nine parameters chosen for inclusion in the index were fecal coliform count, biochemical oxygen demand, pH, NO3, PO4, temperature deviation from equilibrium, turbidity, total solids, and percent saturation of dissolved oxygen. It was shown that all five indexes correlate well with mean ratings devised by a panel of experts, as well as with each other. Harkins' index is in least agreement with the experts' opinions and is the only index that has to be recalculated every time new data become available. Comparisons between data sets are not possible unless index values are recalculated for a merged data set of all values of interest. This major drawback of Harkins' index makes it an untenable choice for a water quality index to be used regularly on a regional or national level. (Henley-ISWS)
W76-10926

AUTOMATED DETERMINATION OF CARBON IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. D. Goulden.
Water Research, Vol. 10, No. 6, p 487-490, 1976. 3 fig, 2 tab, 6 ref.

Descriptors: *Carbon, *Water chemistry, *Carbon dioxide, *Analytical techniques, *Instrumentation, Carbonates, Inorganic compounds, Automation, Chemical analysis, Electronic equipment, Nutrients, Organic compounds, Organic matter, Water pollution, Water quality, Water properties, *Pollutant identification, Suspended solids.
Identifiers: Total carbon, *Organic carbon, Inorganic carbon, Automated method, Infrared analyzer, Cobalt oxide, Flame ionization detector, TOC analyzer.

An automated method for determining inorganic carbon, organic carbon in water was described. The sample is acidified and the CO2 from inorganic carbonate is removed in a packed column and measured with an i.r. analyzer. The stripped liquid is pumped to a furnace containing cobalt oxide catalyst at 950C where the organic carbon is oxidized; the resulting CO2 is measured with an i.r. analyzer. Operating as a 'two-channel' system, inorganic carbon and organic carbon are measured simultaneously at 20 samples per hour. If used in a 'single-channel' mode, inorganic and organic carbon are measured separately, inorganic carbon at 60 samples per hour, organic carbon at 20 samples per hour. The coefficients of variation at 1 and 5 mg/l organic carbon are 5.1 and 2.8% respectively. The detection limit is 200 micrograms/l C. (Henley - ISWS)
W76-10936

MODIFIED CURCUMIN AND DIANTHRIMIDE METHODS FOR THE DETERMINATION OF BORON IN THE PRESENCE OF HIGH LEVELS OF NITRATE AND ORGANICS,
Canada Centre for Inland Waters, Burlington (Ontario).
P. D. Goulden, and Y. P. Kakar.
Water Research, Vol. 10, No. 6, p 491-495, 1976. 1 fig, 4 tab, 9 ref.

Descriptors: *Boron, *Analytical techniques, *Nitrates, *Organic compounds, *Water quality, Organic matter, Inorganic compounds, Solvent extractions, Organic wastes, Water pollution, Automation, Instrumentation, Chemical analysis, Nutrients, Water chemistry, Water properties, *Pollutant identification, Agriculture, Sewage effluents, Irrigation water.
Identifiers: Boron analysis, *Curcumin method, *Dianthrimide method, Nitrate interference.

Modifications have been made to the curcumin and 1,1'-dianthrimide methods for boron analysis so that they may be used in the presence of up to 700 mg/l NO3(-) and 500 mg/l organic carbon. In the curcumin method, nitrate is removed by alkaline reduction using a slurry of aluminum powder. In the dianthrimide method, nitrate up to 1000 mg/l NO3(-) is removed in the dehydration-with-sulfuric-acid step; organics are most conveniently removed by treatment of the dehydrated sample with solid potassium persulfate. With dianthrimide, an automated procedure is used for the color formation and measurement steps. (Henley - ISWS)
W76-10937

SUBSURFACE WATERS OF EROSION TROUGHS IN THE AKTYUBA REGION OF THE URAL - A SOURCE OF DRINKING WATER SUPPLY,
For primary bibliographic entry see Field 2F.
W76-10943

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W76-10950

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10993

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHODS, OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10994

NEAR SURFACE SAMPLER,
Woods Hole Oceanographic Institution, Mass.
J. D. McCleary.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 272-275. 1 fig. NOAA SG 04-4-158-5.

Descriptors: *Water sampling, Equipment, Design, *Pollutant identification, *Sampling, Instrumentation, Measurement.

A device, to obtain water samples from near the water surface, consists of a pine dowel plunger shaft aligned with a 48 inch long pine main shaft. The sample bottle is a standard 280-300 ml nalgene wide mouth bottle secured at the base of the main shaft. The plunger is a removable tapered soft rubber stopper. The plunger assembly is PVC flat stock bent ninety degrees at each end and secured to the main shaft by two screws riding in slots in the plunger assembly. The upper slot has an offset notch to lock the plunger in an open position to help cap the sample bottle before removing, resulting in less spillage; also a fresh sterile bottle can be installed before being uncapped. The assembly is stored in the open position to prevent distortion of the rubber stopper. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10995

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-11007

PELAGIC TAR IN THE NORTH PACIFIC OCEAN,
C. S. Wong, D. R. Green, and W. J. Cretney.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 400-415, 2 tab., 4 fig., 24 ref.

Descriptors: *Oil pollution, *Oil spills, Ships, *Monitoring, *Data collections, On-the-site investigation, Navigation, Oceans, Operators, *Pacific Ocean, Plankton nets, Sampling, *Pollutant identification.
Identifiers: *Tar balls, North Pacific Ocean, Net tows, Plastic pollution, Tar, Plastic wastes.

Monitoring tar lump concentrations by means of net tows would appear to be a convenient method of monitoring the level of oil pollution in the world's oceans from sea-going traffic. One person with a modicum of training and equipment capable of operatingat ships' varying speeds could operate from almost any vessel plying the oceans. A tremendous amount of data on the standing stock of tar lumps in the oceans and how they may vary both seasonally and annually could be in ashort time. (See also W76-11007) (Katz)
W76-11009

SOME REFLECTIONS ON THE BIODEGRADATION OF MINERAL OILS IN THE MARINE ENVIRONMENT,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5B.
W76-11016

EFFECT OF A LIVESTOCK WINTERING OPERATION ON A WESTERN MOUNTAIN STREAM,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
C. M. Milne.
Presented at 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-4058, 17 p, 2 fig, 9 tab.

Descriptors: Streams, *Water pollution, *Bacteria, *Sampling, Analysis, Agricultural runoff, Livestock, Chemical properties, *Pollutant identification, Water analysis, Analytical techniques.
Identifiers: *Confinement wintering operations, *Ion-specific electrode.

A four year project was begun during the winter of 1970-71 to evaluate the impact of livestock confinement wintering operations on the quality of waters adjacent to such operations. The approach taken was to periodically sample stream flow at several points near a wintering operation for constituents which might indicate animal activity. Five stations were established for water sampling and quality measurement. Experimental procedure varied during the course of the project. In the first two years the basic analytical method was the ion-specific electrode. During the third and fourth years of the project, emphasis was on laboratory

bacteriological and chemical analyses. Study of the chemical data revealed that (1) the stream was basically Calcium-Magnesium-Bicarbonate water, (2) chlorides increased in concentration, and (3) nitrogen and phosphorus-related nutrient values were very low. Study of the bacteriological data showed that (1) where a large amount of dispersed animal activity occurred, but was fairly dispersed, little effect on the stream was noted, (2) where the greatest amount of concentrated livestock activity occurred and it was concentrated, bacterial infection increased, and (3) where little activity occurred, bacteria counts were significantly reduced by dilution or drying off. (Cameron-East Central)
W76-11059

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
T. E. Bailey.
In: Proceedings, Tenth Biennial Conference on Ground Water, September 11-12, 1975, Ventura, California, p 174-188, 7 fig.

Descriptors: *Water quality control, *Monitoring, *Water analysis, *Laboratory analysis, *Legislation, State governments, Water pollution, Surface waters, Groundwater, Wells, Water resources development, Planning, Overdraft, Groundwater basins, *California, Water management(Applied), *Classification.
Identifiers: *Water Resources Control Board, Demographic studies, Design control, Operational control.

California, through the State Water Resources Control Board, is developing a water quality surveillance and monitoring program stressing design control and operational control. These two elements describe the rationale for conducting a sampling program and present an opportunity for data interpretation, use and display to directly effect changes in the data collection program. The Board's program will be emphasizing use of agencies' existing activities to form the basis of defining needed changes and additions. The ground water quality monitoring program in California is predicated on establishing priority basins and designating principal aquifers for the purpose of scheduling and budgeting. Priority basins are classified and ranked according to criteria related to population, water use by agriculture, water supply sources, quality problems and available ground water storage capacity. (Heiss-NWWA)
W76-11065

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 7C.
W76-11068

WATER-QUALITY INVESTIGATION, EEL RIVER, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. A. Irwin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 744, $4.00 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-5, April 1976. 35 p, 1 fig, 9 tab, 9 ref.

Descriptors: *Water quality, *Surface waters, *Chemical analysis, Streams, *California, Inorganic compounds, Biochemistry, Chemical properties, Data collections, Sampling, Trace elements, Pesticides, Correlation analysis, Regression analysis, Statistical methods, *Pollutant identification.
Identifiers: *Eel River(Calif).

Water-quality data are summarized for sample collected in the Eel River, Calif., during a reconnaissance study from November 1971 through January 1975. Also included is a summary of the major inorganic chemical data collected near Dos Rios, at South Fork, and at Scotia since early 1950's. The recent reconnaissance involved data collected for nitrogen, phosphorus, total organic carbon, trace elements, and pesticide compounds in the river at Van Arsdale Dam, near Dos Rios, at Fort Seward and at Scotia. Most of the constituents were low in concentration; although some variability was measured for some constituents. Sampling was designed so that each site would represent a large range in discharge. Discharge was not the singular factor controlling the concentration variance for most constituents. However, the concentrations of total ammonia, phosphorus, arsenic, chromium, copper, and zinc indicated a direct relation with discharge at some sites. Statistical analysis indicate that the past sampling program has been adequate to estimate the major chemical constituents of the river. Specific conductance in the river near its headwaters ranges from 110 to 300 micromhos about 98 percent of the time; and at Scotia, near the mouth, the specific conductance ranges from 110 to 340 micromhos about 98 percent of the time. Regression analyses indicate that between 83 and 88 percent of the variance in specific conductance can be explained by discharge. (Woodard-USGS)
W76-11069

GEOHYDROLOGY OF THE ANZA-TERWILLIGER AREA, RIVERSIDE COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W76-11074

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W76-11076

VARIATION IN CONCENTRATION OF SELECTED WATER-QUALITY CONSTITUENTS IN THE SACRAMENTO RIVER AT BEND BRIDGE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
L. J. Britton, and R. C. Averett.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 414/as, $3.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-14, March 1976. 15 p, 5 fig, 2 tab, 13 ref.

Descriptors: *Water quality, *Chemical analysis, *Rivers, *Water analysis, *California, Sampling, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Specific conductivity, Nutrients, Phytoplankton, Streamflow, Flow rates, Evaluation.
Identifiers: *Sacramento River, Bend Bridge(Calif).

During an intensive water-quality study of the Sacramento River at Bend Bridge, Calif., from September 4 to 7, 1973, differences in selected water-quality constituent concentrations were evaluated at three locations at a single site in the river for two 24-hour periods. Water temperature, dissolved oxygen, pH, specific conductance, selected major ions and plant nutrients, and phytoplankton were measured and analyzed to determine thoroughness of mixing in the transection. Slight fluctuations in constituent concentrations occurred with time although the vertical and horizontal differences among sampling locations were not statistically significant at the 0.05 probability level. Consequently, one location probably would have been sufficient to obtain representative concentrations of most water-quality constituents at this site. The measured concentration differences, especially in the plant nutrients, may be of some biological importance where slight fluctuations in low concentrations may cause limiting conditions for plant growth. (Woodard-USGS)
W76-11078

U.S. GEOLOGICAL SURVEY WATER QUALITY MONITOR, OPERATIONS MANUAL,
Geological Survey, Bay Saint Louis, Miss.
J. H. Ficken.
Geological Survey report, April 1976. 31 p, 6 fig, 2 tab.

Descriptors: *Monitoring, *Water quality, *Instrumentation, *Operation and maintenance, *Telemetry, Methodology, Publications, Data collections, Water analysis.
Identifiers: *Operations manual(Water quality monitor).

This manual describes the operation of the U.S. Geological Survey Water Quality Monitor; a system designed to measure and record up to 10 water quality parameters. The system is composed of the following items: Wall mounted cabinet, sensors, sample chamber, timer, and recorder. The cabinet contains the programmer, signal conditioners, buffers, power supplies and standby batteries, and requires 115 V AC current. The sample chamber can hold up to six sensor assemblies and requires a continuous water sample of at least 5 gpm. The operation procedure is described under the following main headings: (1) Side panel connectors; (2) Wiring channel connectors; (3) Mating connectors; (4) Installation; (5) Start up; (6) Shut down; (7) Calibration for all parameters; (8) Adjustment of power supply voltages; (9) Adjustment of amplifier balance; (10) Test probes; and (11) Maintenance and parts replacement. (Woodard-USGS)
W76-11080

WATER-QUALITY DATA FOR CANALS IN EASTERN BROWARD COUNTY, FLORIDA, 1969-1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11081

BARIUM IN SOUTHERN CALIFORNIA COASTAL WATERS: A POTENTIAL INDICATOR OF MARINE DRILLING CONTAMINATION,
Scripps Institution of Oceanography, La Jolla, Calif.
T. J. Chow.
Science, Vol 193, No 4247, p 57-58, July 2, 1976. 2 tab, 4 ref.

Descriptors: *Continental Shelf, *Resources development, *Pollutant identification, *Water pollution sources, Water resources, *Environmental effects, Drilling, Operations, Drilling fluids, Sea water, Chemical analysis, Coasts, California, Pacific Ocean.
Identifiers: *Outer Continental Shelf, *Barium, Offshore drilling, Environmental impact.

The present barium content of Southern California coastal waters was determined to be 11 to 22 micrograms per kilogram of seawater. These values may be used as base-line concentrations to monitor marine contamination during future offshore oil and gas explorations. Sections of the Southern California outer continental shelf have been leased for offshore oil and gas exploration. Many potentially toxic chemical compounds will be unavoidably released into the ocean during the drilling operations. Any spillage of drilling mixture

(in 1975, the United States used 1.4 million metric tons of barite in the drilling mixture), which will result in dissolution of the BaSO4, can be readily detected in terms of a significant increase in Ba2+ in these waters. Therefore, the barium content of seawater may serve as an indicator to monitor drilling-related contamination. (Sinha-OEIS)
W76-11089

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
H. E. Guard, L. Hunter, and L. H. DiSalvo.
Bulletin of Environmental Contamination and Toxicology, Vol 14, No 4, p 395-400, 1975. 1 fig, 1 tab, 7 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Fossil fuels, *Crabs, Environmental effects, Resources development, Water resources, Water pollution effects, Birds, Coasts, *California, Oil wastes, *Pollutant identification, Sea water.
Identifiers: *Outer Continental Shelf, *Bunker fuel, *San Francisco Bay(Calif), Pachygrapsus crassipes.

In January, 1971, approximately 840,000 gal of bunker fuel was accidently discharged into San Francisco Bay. Escaping portions of the oil fouled littoral marine communities and water birds, often with fatal results. Unknown amount of the volatile fractions of oil escaped to the atmosphere, and some dissolved in the water column. The authors report the composition of the seawater extract of a bunker fuel similar to that spilled in 1971, and comment on previous methodology for obtaining the seawater-soluble fraction of bunker fuels as well as the possible significance of the dissolved oil to a local crab species. The fouling of Duxbury Reef, about 20 km north on the coast from San Francisco, suggests that some water-soluble components could have been transported to that location in the oil slick and concurrently dissolved in surface water. Sedentary littoral animals on Duxbury were severely affected by floating oil which became thickly deposited on a great part of the reef. The vagile population of the shore crab Pachygrapsus crassipes, which may have been able to escape the physical effects of the oil, was nonetheless decimated over a large portion of the reef. Similar effects were observed within the Bay at a breakwater near the city of Sausalito. A possible explanation of the disappearance of the crabs is that they were adversely affected by the water-soluble components as identified above. (Sinha-OEIS)
W76-11099

THE ROLE OF DISPERSION IN FUEL OIL BIOASSAY,
Battelle Pacific Northwest Lab., Richland, Wash. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W76-11100

5B. Sources Of Pollution

DETERMINATION OF 14C-DDT RADIOACTIVITY IN SEA WATER AND MARINE SUSPENDED MATTER BY LIQUID SCINTILLATION,
Institut Rudjer Boskovic, Zagreb (Yugoslavia).
For primary bibliographic entry see Field 5A.
W76-10518

POLLUTION POTENTIAL OF RUNOFF FROM LIVESTOCK FEEDING OPERATIONS,
South Dakota State Univ., Brookings. Water Resources Inst.
J. M. Madden, and J. N. Dornbush.
Presented at 1971 Annual Meeting, American Society of Agricultural Engineers, Washington State University, Pullman, June 27-30, 1971, Paper No. 71-212, 15 p. 5 tab, 3 ref.

Descriptors: *Agricultural runoff, *Pollution abatement, *South Dakota, *Feed lots, Livestock, *Farm wastes, Precipitation(Atmospheric), *Water pollution sources, Water pollution control.
Identifiers: *Statistical analysis.

A 2-year study was conducted to determine the quantity and quality of runoff from production feedlots in eastern South Dakota. A statistical analysis was used in evaluating the relationship between runoff volume, precipitation amounts, and animal concentration and the pollutional constituents associated with runoff. The following conclusions were drawn: (1) Estimation equations using feedlot characteristics and design runoff volumes can be applied to determine the total and suspended solids, plant nutrients, and oxygen demanding material in feedlot runoff. (2) Conventional methods of determining runoff from rainfall may not give accurate estimates of runoff from livestock feedlots. (3) Although the annual losses of animal waste from feedlots by runoff represent a small percentage of the total waste produced, the quantities are sufficient that control measures must be provided on feedlots whose runoff reaches lakes and streams. Further study is needed. (Merryman-East Central)
W76-10531

EFFECT OF CATTLE FEEDYARD RUNOFF ON SOIL INFILTRATION RATES,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
O. R. Lehman, and R. N. Clark.
Journal of Environmental Quality, Vol. 4, No. 4, p. 437-439, October-December, 1975. 5 fig, 6 ref.

Descriptors: *Cattle, *Feed lots, *Agricultural runoff, *Infiltration rates, Soils, Groundwater, Farm wastes, Water pollution sources.

A compact clay soil from a playa lake and a relatively porous, blocky, buried soil, both representative of feedyard runoff holding basins in the Texas High Plains, were treated with clear water and synthesized feedyard runoff to test the effects of runoff on soil permeability. Infiltration rates changed most notably with the buried soil, where the rate decreased from 5 cm/hour for clear water, to less than 0.006 cm/hour for the synthesized runoff. The addition of the synthesized feedyard runoff quickly reduced infiltration rates in both the laboratory cores and field basins. Rates were reduced to less than 0.006 cm/hour in 14 to 20 days in all cores and basins receiving the runoff. Sealing was attributed to clogging at or near the surface because the initial infiltration rate was restored when the top 2 cm of soil was removed. For basins constructed in porous soil material, clay liners decreased the time required for sealing, but did not necessarily change the degree of sealing. One main benefit of a clay liner would be to decrease the total volume of water infiltrated. (Cameron-East Central)
W76-10538

EFFECT OF SOIL-INCORPORATED DAIRY CATTLE MANURE ON RUNOFF WATER QUALITY AND SOIL PROPERTIES,
Agricultural Research Service, Auburn, Ala.
F. L. Long, Z. F. Lund, and R. E. Hermanson.
Journal of Environmental Quality, Vol. 4, No. 2, p 163-166, 1975. 3 fig, 6 tab, 14 ref.

Descriptors: *Agricultural runoff, *Nitrates, Biochemical oxygen demand, *Farm wastes, Soil properties, Cattle, Water pollution sources, Decomposing organic matter, Crop response.
Identifiers: *Land application, Rye, Millet.

A study was made on .04 ha plots of Norfolk sandy loam to determine the effects of cattle manure application on the quality of runoff water and soil properties. Gahi-1 pearl millet and Abruzzi rye were grown separately on 2 plots each. Manure was applied to 2 plots at rates of 45 metric tons per ha on a dry rate basis for 3 years. The 2 check plots received 450 kg N, 160 kg P, and 180 kg K ha-1 year-1. The BOD of the runoff water from manured plots did not exceed that from the control plots. The nitrate levels of runoff water from manured plots were affected very little by either application and all values were less than 5 mg per liter. Nitrates increased slightly in the top 90 cm of the manured plots; organic nitrogen increased only to a depth of 15 cm. Nitrate accumulated in millet forage above the safe level for feeding cattle, but not in the rye forage. Soil pH was increased to a range of 5.7 to 6.6 to a depth of 60 cm by manure application. Organic matter decomposed fairly rapidly and at the end of 3 years only 38 percent of the applied carbon remained. These results indicate that at least 45 metric tons per ha of dairy cattle manure can be disposed of on a Norfolk sandy loam by incorporation into the surface 15 cm of soil for a period of at least 3 years without any appreciable effect on the quality of runoff water or soil. (Cannon-East Central)
W76-10539

EXCESSIVE MANURE CAN AFFECT POTABLE WATER.
Hoard's Dairyman, Vol. 120, No. 13, p 799, July 10, 1975.

Descriptors: *Groundwater pollution, *Pennsylvania, *Regulation, *Dairy industry.
Identifiers: *Land application, *Application rates.

Five years of experiments were made to determine what happens under Pennsylvania soil and crop conditions when concentrated operations use the land for manure disposal. Dairy manure slurry was injected under orchard grass sod at rates of 120-600 tons per acre yearly for three years. The lowest rate supplied 700 lbs of nitrogen per acre per year. Two years after the applications were discontinued, Penn State researchers still found nitrate nitrogen in the soil water in excess of 10 milligrams per liter, the potable water standard. This was found at 4 feet, where the lowest rate had been applied. Fifty to eighty tons of slurry per acre, supplying 300-500 lbs of nitrogen per acre, were injected in November, 1973, and in April, 1974, to compare fall and spring applications. Nitrate nitrogen from the fall application had moved down four feet in soil water by June of 1974 but remained near the potable standard of 10 milligrams per liter after July. The nitrate nitrogen from the spring-applied manure never exceeded 10 milligrams per liter during the growing season. (Merryman-East Central)
W76-10542

PHYSICAL AND CHEMICAL PROPERTIES OF OUTDOOR BEEF CATTLE FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Inst. of Agriculture and Natural Resource.
C. B. Gilbertson, J. R. Ellis, J. A. Nienaber, T. M. McCalla, and T. J. Klopfenstein.
Research Bulletin 271, Agricultural Experiment Station, University of Nebraska, Lincoln, August, 1975, 16 p. 2 fig, 11 tab, 16 ref.

Descriptors: *Physical properties, *Chemical properties, *Feed lots, *Agricultural runoff, *Nebraska, Design criteria, Cattle, Farm wastes, Water pollution sources, Pollutant identification, Sampling.

From August, 1968 to December, 1972, feedlot runoff and its control were studied. Continuous flow systems, a batch system, and pairs of feedlots with a buffer strip between each pair were established. Automatic samplers were installed to obtain composite samples of runoff from each feedlot and of

effluent discharged from each debris basin. Physical and chemical analyses were performed. Total, fixed, and volatile solids transported in rainfall runoff averaged 1.52, 0.84, and 0.68 (percent w.b.) respectively. Solids transported in rainfall runoff were 28 percent filtrable solids. The volatile solids portion decreased with a decrease in particle size while the particle density increased. The unit weight of runoff was 63.02 lb per cu ft. Settleable solids transported in runoff and discharged from the debris basin to the holding pond averaged 217 and 63 cu ft per acre-inch (60, 760, and 17,640 ppm) respectively. Bulk density of the settleable solids in runoff and discharged from the debris basin to the holding pond averaged 10.72 and 8.03 lb per cu ft respectively. Seventy-one percent (by weight) of the settleable solids settled within the first 15 minutes under static conditions. Runoff COD ranged from 14,100 to 77,100 mg/l in snowmelt runoff and 1300 to 8200 mg/l for rainfall runoff. Total N and P concentration in rainfall runoff averaged 916 and 361 ppm, respectively. Average values were 2105 and 292 ppm for snowmelt runoff. Solids transport and settling characteristics data may be valuable in calculating detention times and storage capacities for solids settling facility design. Results can also be used to calculate solids accumulations in holding ponds to estimate maintenance requirements. Feedlot runoff should be restricted from freely flowing into streams. (Merryman-East Central)
W76-10543

INTACT MANURE PACKS HALT SEEPAGE.
For primary bibliographic entry see Field 5G.
W76-10544

WATER QUALITY AND MANAGEMENT CHARACTERISTICS OF FEEDLOT RUNOFF HOLDING PONDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W76-10545

FARM ANIMAL MANURES: AN OVERVIEW OF THEIR ROLE IN THE AGRICULTURAL ENVIRONMENT,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5G.
W76-10548

QUALITY VARIATION OF FEEDLOT RUNOFF IN STORAGE,
Agricultural Research Service, Lincoln, Nebr.
C. L. Linderman, and J. R. Ellis.
Presented at the 1975 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 15-18, 1975, Paper No. 75-2563, 16 p. 9 fig, 2 tab, 10 ref.

Descriptors: *Feed lots, *Agricultural runoff, *Waste storage, Water quality, Nutrients, Chemical properties, Farm wastes, Water pollution sources.
Identifiers: *Holding ponds, Land disposal.

Studies were performed to determine changes in feedlot runoff effluent stored in holding ponds. Feedlot runoff effluent stored in holding ponds may vary in composition due to solids settling, microbial activity, evaporation, and dilution by direct rainfall. These factors had the greatest effect on runoff which was stored with no additions of new runoff. Solids, nitrogen, phosphorus, and salts varied twofold to threefold. When no new runoff was added, NH4-N varied sevenfold and electrical conductivity varied ninefold. If it is desired to efficiently utilize the nutrients in feedlot runoff in land disposal, chemical analyses should be performed periodically. This should foster better utilization of nutrients and should arm the feedlot operator in controlling soil salinity. (Merryman-East Central)
W76-10549

SAMPLERS FOR MONITORING RUNOFF WATERS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-10550

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 5G.
W76-10564

ANATOMY OF AN OIL SPILL,
W. Wertenbaker.
Marine Technology Society Journal, Vol 8, No 3, p 16-28, March 1974.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, Water resources, Water pollution effects, Water pollution sources, *Ecosystems, *Pollutant identification, *Oil industry, Continental shelf, Coasts, Beaches, Marshes, Fishkill, Shellfish, Invertebrates, Barges, Grasses, Estuaries, Inlets(Waterways), Bays, Fish, *Massachusetts.
Identifiers: *Outer Continental Shelf, Environmental impact, Refineries, Crude oil, Petroleum, Hydrocarbons, Tankers, West Falmouth(Ma).

An exposition is presented of a major research effort in a continuing controversy concerning the effects of an oil spill. On the evening of September 15, 1969, a tug, New York Central No. 34, and a barge started up Buzzards Bay toward the Cape Cod Canal. The barge carried almost two thousand five hundred tons of No. 2 fuel oil. She was called the Florida. Near midnight, several miles up the bay from Woods Hole, the tug and the Florida went hard aground on a cluster of submerged boulders, which tore a hole in the bottom of the barge. By daylight the stench of oil was far inland, and a slick of oil could be seen downwind from the barge as far as Nye's Neck, in North Falmouth, two miles away. In scientific generalities, the marine animal population of the area, in the course of the next week or so, declined from about two hundred thousand animals per square metre to about two animals per square metre. Details are given on the depopulation of various small areas within the vicinity of the spill. The oil industry has advanced the view that the effects of spills have been hysterically overstated. During the second year after the spill, the less polluted areas were periodically repolluted with fresh oil from inshore; but in the spring marsh grass began to grow in some places. The oil continued to weather and degrade on the surface of the sediments. The spill showed, contrary to almost all published statements that some parts of petroleum will dissolve in water-namely, the toxic aromatics, and that petroleum will as readily sink as evaporate. It also showed the relative ineffectiveness of all present means of dealing with oil after a spill. (Sinha-OEIS)
W76-10597

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,
M. H. Fallah, and R. M. Stark.
Marine Technology Society Journal, Vol 10, No 1, p 3-18, January 1976. 12 fig, 1 tab, 198 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution sources, Water pollution effects, *Resources development, Water resources, *Bibliographies, Continental shelf, Spreading, Drifting(Aquatic), Diffusion, Dispersion, Pollutants, *Path of pollutants.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact.

The continuing importance of understanding the movement of spilled oil at sea suggests the usefulness of reviewing the state of the art and referencing the many publications in a single source. Four distinct modes of oil-water interaction are recognized: spreading, drift, diffusion, and dissipation. An overview is provided of some of the important works. It is followed by a comprehensive bibliography. (Sinha-OEIS)
W76-10599

TRANSPORT OF CHLORINATED HYDROCARBONS IN SEDIMENTS OF THE UPPER CHESAPEAKE BAY,
Westinghouse Oceanic Div., Annapolis, Md.
H. D. Palmer, K. T. S. Tzou, and A. Swain.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 688, $6.75 in paper copy, $3.00 in microfiche. (1976), 109 p, 46 fig, 7 tab, 53 ref, append. OWRT C-5160(4204) (1).

Descriptors: *Chlorinated hydrocarbons, *Sediment transport, *Estuaries, *PCB, *DDT, *Chlordane, *Seston, Maryland, Circulation, Bottom sediments, Tidal currents, *Chesapeake Bay, *Path of pollutants, Water pollution.
Identifiers: Susquehanna River(Md), Baltimore Harbor(Md).

The analyses of both bottom sediments and seston from 3 depths over 28 hour periods at fixed stations have yielded information on the levels of PCB, DDT and chlordane in the Upper Chesapeake Bay of Maryland. Seston samples showed mean concentrations of 4.3 ppt (parts per trillion) of PCB, .23 ppt of DDT and .81 ppt chlordane off Annapolis; off Baltimore Harbor the mean concentrations were 4.5 ppt PCB, .27 ppt DDT and .62 ppt chlordane. At the head of the bay, these values were 12.08 ppt PCB, 1.03 ppt DDT and 0.72 ppt chlordane. Transport direction was generally to the south. It is concluded that most of the chlorinated hydrocarbon compounds in the upper bay have come from the Susquehanna River drainage, and that Baltimore Harbor, although displaying high local values in bottom sediments, is not a major source to the upper bay.
W76-10607

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
G. F. Cochran, D. Fitzsimmons, J. Garrett, and G. Watson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 716, $5.00 in paper copy, $3.00 in microfiche. Center for Water Resources Research, Publication No. 16, Dec. 1973. 85 p, 22 fig, 37 tab, 87 ref, 2 append. OWRT C-2152-NEV(3371) (1).

Descriptors: *Water management(Applied), Urbanization, Water utilization, *Nevada, Arid lands, *Water quality, Groundwater, *Water supply, Water reuse, Reclaimed water, Artificial recharge, Model studies, Surface-groundwater relationships.
Identifiers: *Las Vegas Valley(Nev).

This report is the third in a series of four to be published on a study entitled, 'Research and Analysis to Plan, Develop, and Manage a Ground and Surface-Water Supply.' The area considered is the Las Vegas Valley in southern Nevada where a ground- and surface-water supply system has been developed. This report focuses on (1) water quality considerations as they pertain to water supplied for domestic, industrial and municipal uses from resources of different quality and quantity; (2) laws and institutions which play an active role in

all aspects of water quality, such as primary water use, reclaimed water use, artificial ground-water recharge and control of once used water and its discharge; (3) potential uses, values and costs of reclaimed water after various levels of treatment, (4) continued extention and refinement of the master water resource model for the area; and (5) examination of the effects of water quality constraints and objectives on 'optimal' water use policies as determined with the master water resource model. (See also W72-01333 and W74-01662) (Fallon-Nevada)
W76-10608

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT: PARAMETER IDENTIFICATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 648, $4.50 in paper copy, $3.00 in microfiche. Cornell University Water Resources and Marine Sciences Center, Ithaca, May 1976, 67 p, 10 fig, 5 tab, 65 ref, 3 append. OWRT A-052-NY(1). 14-31-0001-5032.

Descriptors: *Groundwater, *Artificial recharge, Kinetics, Adsorption, Mass transport, Equations, Simulation analysis, Water reuse, *Mathematical models, Model studies, Algorithms, Finite element analysis, Management.

Mathematical models are presented for assessing the potential impact of the artificial recharge of municipal wastewater effluents on the subsurface environment. Wastewaters are assumed to be recharged to a shallow unconfined groundwater aquifer in surface spreading basins. A Galerkin finite element simulation model predicts the time and spatial variations of conservative and nonconservative constituent concentrations within the soil profile. The model incorporates time dependent non-equilibrium absorption and chemical and/or biochemical reactions. The Galerkin procedure transforms the partial differential equations describing mass transport and absorption into systems of first-order ordinary differential equations. The resulting equations are recursively solved by finite difference techniques. The simulation equations form the basis for the parameter identification model which is formulated as a quadratic programming problem using a generalized Newton-Raphson procedure. The model is used to estimate (1) the kinetic, dispersion, and adsorption parameters characterizing quality changes within the soil system, and (2) the initial distribution of a contaminant within the sorbed or solution phases at the inception of the spreading cycle. The simulation model and the parametric identification algorithm are validated using published analytical solutions of the adsorption and mass transport equations. The results indicate the computational efficiency of the identification algorithm for the large scale estimation of groundwater quality parameters.
W76-10613

CHEMICAL AND MICROBIOLOGICAL CHANGES IN POULTRY LITTER APPLIED TO SOIL AS INFLUENCED BY THE TIME AND METHOD OF APPLICATION,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W76-10615

MANURE AND THE NITRATE PROBLEM,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5E.
W76-10616

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
For primary bibliographic entry see Field 5G.
W76-10623

REPORT ON POLLUTION OF INTERSTATE WATERS OF THE CONNECTICUT RIVER.
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-10626

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
For primary bibliographic entry see Field 5D.
W76-10627

INTERFACIAL CHEMISTRY OF PARTICULATE FLOTATION,
Henry Krumb School of Mines, New York.
P. Somasundaran.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 1-15, 1975. 24 fig, 3 tab, 100 ref.

Descriptors: *Flotation, *Chemical properties, *Physical properties, *Water pollution treatment, Separation, Frothing, Flocculation, Treatment.
Identifiers: Precipitate flotation.

Basic principles governing particulate flotation are reviewed, with particular emphasis on the interfacial chemistry involved. Although froth flotation is emphasized, precipitate flotation which appears to hold promise for future applications is also discussed. Topics covered include: the classification of flotation techniques on the basis of separation mechanism and size of the material separated, selective hydrophobicity, frothing, flotation activation and depression, flotation deactivation, and the effects of such variables as collector chain length, surfactant chemical structure, collector concentration, solution pH, collector ionic strength, flocculant and dispersant addition, and the conditioning temperature. Techniques for studying the mechanism of particulate flotation are also discussed. (See also W76-10627) (Kreager-FIRL)
W76-10628

ELECTROCHEMICAL PROPERTIES OF THE OXIDE-SOLUTION INTERFACE IN RELATION TO FLOTATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Sciences Div.
S. M. Ahmed.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 24-33, 1975. 11 fig, 2 tab, 48 ref.

Descriptors: *Flotation, *Adsorption, *Electrochemistry, *Waste treatment, *Oxides, Chemical properties, Electrical properties, Ions, Water pollution control.

The electrochemical nature of the oxide-solution interface is discussed in relation to the adsorption and flotation properties of oxides. Hydrogen and hydroxyl ions, when adsorbed on oxide surfaces, together constitute a polarizable hydration layer with a hydrogen-bonded structure. For surface behaviors characterized as acidic where the pH range is above the zero point of charge and where there is little or no dissociation, hydrogen and hydroxyl ion activities in the hydration layer are greatly altered due to ion-surface interactions. The corresponding potential drop is attributed to the re-orientation of water dipoles and to the rearrangement of the hydrogen-bonded structure. The surface charge densities are low in this pH range, but the adsorption of neutral organic molecules such as starches and alcohols can be high. As the pH is increased, the double layer becomes strongly ionic due to acidic dissociation of the surface hydroxyl groups; and a further potential drop occurs in the compact layer due to specific adsorption of cations. Oxides characterized by a basic surface behavior of dissociation display the converse behavior, and the oxides characterized by amphoteric dissociation display a composite behavior of the above two types, with or without the specific adsorption of anions. (See also W76-10627) (Kreager-FIRL)
W76-10629

DETERMINATION OF SURFACE EQUILIBRIA AND MASS TRANSFER RATES IN A CONCURRENT FLOW BUBBLE COLUMN,
California Univ., Berkeley. Dept. of Chemical Engineering; and California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 5D.
W76-10632

BEHAVIOR OF HYDROGEN AND HYDROXYL IONS AT THE OXIDE-WATER INTERFACE,
Kyoto Univ., (Japan). Dept. of Mineral Science and Technology.
T. Wakamatsu, and S. Mukai.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 81-87, 1975. 12 fig, 17 ref.

Descriptors: *Adsorption, *Flotation, *Waste treatment, *Ions, Hydrogen, Surfactants, Separation techniques, Chemical properties, Performance.
Identifiers: Hydroxyl ions, Sodium dodecylsulfonate.

Adsorption isotherms of hydrogen and hydroxyl ions on alumina were determined in the presence and absence of sodium dodecylsulfonate by means of an acid titration method. The pH value at which hydrogen and hydroxyl ions are equally adsorbed onto the alumina, known as the equi-adsorption point, was also determined. Both studies were performed to explain the behavior of such ions in terms of collection and depression mechanisms in flotation. The equi-adsorption point for alumina occurred at a pH value of 7.4, while the isoelectric point for the same material occurred at a pH of 9.0. The equi-adsorption point of alumina did not change even with the addition of dodecylsulfonate. It was also established that the adsorption density of hydrogen ion as well as that of hydroxyl ion on alumina increased with an increase in sulfonate concentration. (See also W76-10627) (Kreager-FIRL)
W76-10633

CHARACTERIZATION OF ADSORBED COBALT AT THE OXIDE-WATER INTERFACE,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
For primary bibliographic entry see Field 5D.
W76-10634

ADSORPTION MECHANISM OF SULFIDES AT A PLATINUM-SOLUTION INTERFACE,
Karnataka Regional Engineering Coll., Suratkal (India).
For primary bibliographic entry see Field 5D.
W76-10636

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.

W76-10637

FLOW OF TOXIC METALS IN THE ENVIRONMENT,
Pan American Health Organization, Mexico City.
D. W. Jenkins.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 1-1-1 - 1-1-5. 2 fig, 5 tab, 22 ref.

Descriptors: *Metals, *Toxicity, *Surface waters, *Ecosystems, *Water pollution effects, *Groundwater, Oceans, Rivers, Estuaries, Waste disposal, Arsenic compounds, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Nickel, Zinc, Washouts, Leaching.
Identifiers: Anitimony, Tin, Vanadium, Enrichment factors.

The various pathways and flows of twelve toxic metals through the air, terrestrial ecosystems, freshwater, and the ocean are outlined. Pathways relevant to water pollution include: washout and deposition from the atmosphere, leaching and sewage disposal from terrestrial ecosystems to fresh water, the flow of fresh water via rivers and estuaries to the ocean, and the direct dumping of wastes via ocean outfalls. Each environmental compartment has metals flowing in and out of it, with the exception of the ocean. The ocean receives large amounts of toxic metals, but only a small portion of these metals leave in the form of marine products. Oceanic levels of antimony, arsenic, cadmium, chromium, cobalt, copper, lead, mercury, nickel, tin, vanadium, and zinc are estimated at 617, 2740, 27, 55, 685, 1370, 55, 137, 2740, 4110, 2740, and 13,700 million tons, respectively. The amounts of these metals added to the ocean annually as a result of river flow and atmospheric washout are also tabulated. Maximum enrichment factors of marine organisms are also presented. (See also W76-10637) (Kreager-FIRL)
W76-10638

SOME CONSIDERATIONS ON MONITORING OF TRACE METALS IN ESTUARIES AND OCEANS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5A.
W76-10653

ENVIRONMENTAL QUALITY SURVEILLANCE IN INDONESIA,
National Inst. of Health, Research and Development, Djakarta (Indonesia).
For primary bibliographic entry see Field 5A.
W76-10655

MONITORING GROUNDWATER POLLUTION,
For primary bibliographic entry see Field 5A.
W76-10659

GROUNDWATER POLLUTION MONITORING CASE STUDIES,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 5A.
W76-10661

AUTOMATED FORECAST PROCEDURES FOR RIVER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 5A.
W76-10664

A STRATEGY FOR AQUATIC POLLUTANTS FATE AND TRANSPORT DETERMINATION,
Environmental Research Lab., Athens, Ga.
W. M. Sanders, III.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 14-7-1 - 14-7-5. 1 tab, 25 ref.

Descriptors: *Model studies, *Water quality, *Chemical degradation, *Kinetics, *Water pollution effects, Chemical reactions, Chemical properties, Rivers, Lakes, Organophosphorus pesticides, Chlorides, Computer programs.
Identifiers: Malathion, Vinyl chloride, Chlorinated hydrocarbons, Transformation.

A strategy developed by the Environmental Protection Agency for obtaining transport and fate information for aquatic pollutants is outlined. Studies are first conducted to determine whether degradation or transformation reactions occur and if their rates are fast enough to be environmentally significant. If the results are positive, detailed mechanistic and kinetic studies are then conducted. A final evaluative phase of the strategy involves observing the results of various competing or enforcing reactions. The various rate processes are described mathematically, and the resulting equations are coupled to form evaluative computer models. These models do not represent any particular aquatic system but are structured so that each important environmental factor can be varied within the ranges observed in nature. The model results can be presented as concentration and distribution profiles for parent compounds and for degradation products. Applications of the modeling strategy involving the prediction of vinyl chloride half-life in lake and river ecosystems and the degradation of the organophosphorus pesticide malathion in a river ecosystem are described. (See also W76-10637) (Kreager-FIRL)
W76-10665

REMOTE SENSING OF GROUND AND SURFACE WATER CONTAMINATION BY LEACHATE FROM LANDFILL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-10666

MONITORING ESTUARINE CIRCULATION AND OCEAN WASTE DISPERSION USING AN INTEGRATED SATELLITE-AIRCRAFT-DROGUE APPROACH,
IIT Electro-Physics Lab., Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W76-10671

SORPTION CAPABILITIES OF SOILS FOR PHOSPHATE REMOVAL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
For primary bibliographic entry see Field 5D.
W76-10673

WATER POLLUTION THROUGH RAIN OVERFLOWS FROM MIXED SEWERS (GEWASSERVERSCHMUTZUNG DURCH REGENUBERLAUFE AUS MISCHKANALISATIONEN),
A. G. Herik.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 529-549, 1976. 15 fig, 3 tab, 9 ref.

Descriptors: *Combined sewers, *Overflow, *Water levels, *Rain water, *Sewerage, Sewage sludge, Flow rates, Biochemical oxygen demand, Dissolved oxygen, Sewage bacteria, Nitrates, Phosphates.
Identifiers: Netherlands.

Experiments on water pollution through rainwater overflows from mixed sewers are described in connection with preliminary standards promulgated in the Netherlands. With a minimal water depth of 1.5 to 2.0 m in the recipient, a specific recipient surface of 4 sq m per inhabitant is required and is sufficient for the uptake of the rain overflow. The flow rate should be low enough to achieve settling rather than whirl-up of sludge by the storm runoff in the sewer. To minimize the sludge entrainment from the sewer system, the latter should be as short as possible, and straight pipes with steady slope and without changes in their cross-section should be used. After overflow, the water quality of the recipient is normalized in a relatively short time concerning the BOD load, oxygen content and the bacterial contamination, while the increased nitrate and phosphate contents may require the additional discharge of fresh water. (Takacs-FIRL)
W76-10688

WATER TRACING IN TROPICAL REGIONS, THE USE OF FLUOROMETRIC TECHNIQUES IN JAMAICA,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2F.
W76-10701

DENSITY CURRENT SURGES I--THEIR ROLE IN THE INITIAL DISPERSION OF A SURFACE FIELD,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. H. Bache.
Journal of Hydraulic Research, Vol. 14, No. 1, p 1-7, 1976. 3 fig, 12 ref.

Descriptors: *Density currents, *Dispersion, *Surges, *Turbulence, *Interfaces, Pollutants, Streamflow, Laboratory tests, Hydraulics, Model studies, Mixing, *Path of pollutants.
Identifiers: *Inviscid flow, Density gradient.

Buoyancy forces acting on a pollutant discharged into a stream cause a surface density field, transported at the local velocity. This density field is dispersed by density gradient instabilities and turbulence. The case of dispersion dominated by density gradient effects was considered, neglecting the action of turbulence. The early behavior of a density surge was developed on the basis of inviscid flow theory. Experiments to determine the effect of density difference on the transverse spreading of a surface field were performed in a broad tilting flume, using a recirculatory system. Laboratory results indicated that the dispersion in the initial phase is independent of turbulence. Agreement was satisfactory between the experimental and theoretical results at large density differences and at short time. Departures at small density differences and large times were attributed to the influence of turbulent mixing and simplifications used. (See also W76-10708) (Singh - ISWS)
W76-10707

DENSITY CURRENT SURGES II--THE MOVEMENT OF SURGES IN A TURBULENT ENVIRONMENT AND THEIR ROLE IN SURFACE FIELD DISPERSION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. H. Bache.
Journal of Hydraulic Research, Vol. 14, No. 1, p 8-16, 1976. 6 fig, 2 tab, 8 ref.

Descriptors: *Density currents, *Dispersion, *Momentum equation, *Turbulence, *Intfaces, Streamflow, Model studies, Mixing, Laboratory tests, Hydraulics, Surges, Equations, Path of pollutants.
Identifiers: *Surface field dispersion, Momentum block.

The surge motion arises through a conversion of potential energy into kinetic energy and continues until turbulence dampens out such exchanges (lateral spreading of surface density field) or until the main supply of available energy becomes exhausted. The outward surge causes the field to

split into two momentum blocks. The size of the momentum block was defined in terms of a characteristic length and depth. These lengths reflect dynamically the amount of material carried within the momentum block. Experiments were performed to generate blocks possessing differing initial momenta and to vary the level of turbulence of the recipient flow. Freshwater was discharged through a rectangular surface source into an ambient stream whose density was varied. Levels of turbulence were varied by altering the slope and depth of the ambient flow. The study showed that a simplified view of blocks of momentum continuously mixing with their environment can adequately reflect the transverse spreading of a surface density field following the development of surges at the field edges. (See also W76-10707) (Singh - ISWS)
W76-10708

DISTRIBUTION OF STREAM POLLUTION IN LAKE WATER,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
R. W. Tew, S. S. Egdorf, and J. E. Deacon.
Journal of the Water Pollution Control Federation, Vol. 48, No. 5, p 867-871, May 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Bacteria, *Distribution patterns, *Model studies, Aquatic bacteria, *Path of pollutants, *Nevada, Population, Microorganisms, Thermophilic bacteria, Distribution, Estimating, Tracers, Spatial distribution, Tracking techniques, Water pollution, Analytical techniques, Lakes, Streams, Pollutants, Sampling, On-site investigations, Fluorescent dye.
Identifiers: *Bacterial tracers, *Lake Mead(Nev), Stream pollution, *Tracer techniques, Boulder Basin(Lake Mead), Inflowing stream.

A time-distance-depth distribution matrix of indigenous, oxidase-positive or yellow-orange bacterial population components was used to ascertain the fate of waters from a polluted stream in a reservoir of very large volume. Isolates were described sufficiently to identify population components as operational units; strict identification was not sought nor required. Precepts and conditions governing work with bacterial tracers were discussed. (Henley - ISWS)
W76-10712

NUTRIENT TRANSPORTS THROUGH LANCASTER SOUND IN RELATION TO THE ARCTIC OCEAN'S REACTIVE SILICATE BUDGET AND THE OUTFLOW OF BERING STRAIT WATERS.
Washington Univ., Seattle. Dept. of Oceanography.
L. A. Codispoti, and T. G. Owens.
Available from the National Technical Information Service, Springfield, Va 22161, as ADA-011 883, $3.50 in paper copy, $3.00 in microfiche. Limnology and Oceanography, Vol. 20, No. 1, p 115-119, January 1975. 4 fig, 1 tab, 17 ref. ONR N-00014-67-A-0103-0014.

Descriptors: *Nutrients, *Silicates, *Arctic Ocean, *Silica, Water transfer, Arctic, Chemical analysis, Nitrates, Water quality, Phosphates, Phosphorus, Sea water, Saline water, Salinity, Chemical properties, Oceans, Surface waters, Analytical techniques, Ammonium compounds, On-site investigations, *Path of pollutants, Canada.
Identifiers: *Nutrient transport, *Lancaster Sound, Reactive silicate, *Bering Strait, Reactive phosphorus.

Data from the Lancaster Sound region help balance the Arctic Ocean's reactive silicate budget, but a net removal is still indicated. The reactive phosphorus and reactive silicate concentrations in Lancaster Sound suggest an enrichment with Bering Strait waters. (Henley - ISWS)
W76-10717

CHARACTERIZATION AND TREATMENT OF BRINE WASTEWATERS FROM THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ., at Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 3E.
W76-10805

A SIMULATION MODEL OF TRITIUM KINETICS IN A FRESHWATER MARSH,
Ohio Cooperative Wildlife Research Univ, Columbus.
T. A. Bookhout, and G. C. White.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 761, $5.00 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 487X, June 1976. 88p,p 18 fig, 9 tab, 38 ref. OWRT A-038-OHIO(1).

Descriptors: *Water pollution, *Tritium, *Freshwater marshes, *Simulation analysis, Radioecology, Lake Erie, Radioisotope, Aquatic environment, *Marshes, Computer models, *Model studies, Nuclear powerplants, *Ohio, Lakes, Monitoring, Crayfish.
Identifiers: Navarre Marsh(Ohio), Tritiated water.

A simulation model of tritium kinetics was developed from data collected in a Lake Erie marsh from November 1973 to October 1974. Approximately 11 Curies of tritiated water (HTO) were released into the marsh, and the loss of HTO was monitored for one year. Models were fitted to these data with nonlinear least squares to provide maximum likelihood estimates of parameters. The initial model of the marsh water was a simple differential equation whose solution was a boundary condition for the partial differential equation used to describe HTO kinetics in the sediment. A second model of the water-sediment was developed to allow environmental variations to influence tritium kinetics. A 31-compartment system was assumed. HTO concentration in the marsh water was affected by HTO levels in the atmosphere, marsh water temperature, marsh depth, and rate of change of marsh depth. Organisms were described by a two-compartment model, a body water compartment, and a tissue compartment, with interchange between compartments. Estimated parameters for crayfish (Procabarus blandingi) showed that much of the tritium in tissue comes from food. A new parameter estimation technique was developed which allowed both sampling error and variation in the observed process. This method removed the autocorrelation found in the residuals when the process variation was significant relative to the sampling error. Simulated data were used to verify the technique.
W76-10812

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-10813

DEVELOPMENT OF A WATER QUAITY SIMULATION MODEL APPLICABLE TO GREAT SALT LAKE, UTAH,
Utah Center for Water Resources Research, Logan.
C. T. Jones, W. J. Grenney, C. G. Clyde, and J. P. Riley.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 718, $6.00 in paper copy, $3.00 in microfiche. Utah Water Research Laboratory, Publication PRJEW026-1, June 1976. 129 p, 55 fig, 9 tab, 48 ref, 2 append. OWRT A-025-UTAH(1), 14-31-0001-5045.

Descriptors: *Advection, *Diffusion, *Water quality, *Simulation analysis, Water balance, Salt balance, Dissolved oxygen, Water resources development, *Great Salt Lake, *Utah, *Model studies, Networks, Forecasting, Monitoring, *Distribution patterns, Path of pollutats, Water pollution.

The development of a model capable of predicting the long term (seasonal) distribution of water quality constituents within Great Salt Lake was undertaken as a portion of the ongoing Great Salt Lake project. This study provides a model capable of monitoring the long term distribution of quality constituents within the lake. This capability is a necessary component of the modeling framework since it will allow the investigation of the effects which alternative water quality management plans will have on the distribution of water quality constituents within the lake. The water quality model of the lake is based on the application of the advection-diffusion equation to the three-dimensional transport of a quality constituent. The modeling technique is formulated by discretizing the system as a network of nodes interconnected by channels in both the horizontal and vertical directions. In applying the model to Great Salt Lake, a two-layered vertical network was employed and the vertical transport was described by diffusion alone due to the physical characteristics of the system. Using observed total dissolved solids concentrations, a method was developed during the study for establishing the vertical diffusion coefficient as a function of depth. A unique feature of this water quality modeling technique is that it allows the seasonal distribution of a quality constituent to be studied without the necessity of developing a hydrodynamic model of the system.
W76-10815

AN INVESTIGATION OF EFFLUENT CONTROL STANDARDS AND PRACTICES (ATOMIC ENERGY PRODUCTION),
Douglas United Nuclear, Inc., Richland, Washington.
For primary bibliographic entry see Field 5G.
W76-10828

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10829

LIGNOSULFONATES AND NATURAL WATER-SOLUBLE LIGNIN IN THE LIELUPE RIVER (LIGNOSUL'FONATY I PRIRODNYI VODORASTVORIMYI LIGNIN V VODE R. LIELUPE),
Akademiya Nauk Latviiskoi SSR. Inst. of Wood Chemistry.
E. A. Aunin'sh, and A. D. Tupureine.
Khimiya Drevesiny, No. 6, p 91-97, November/December, 1975. 3 fig, 10 ref, 1 tab.

Descriptors: *Lignins, *Pulp wastes, *Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Bacteria, Oxidation, Water temperature, Self-purification, Water purification, Water pollution, Water pollution effects, Path of pollutants.
Identifiers: *Lielupe River(Latvia), Lignosulfonic acids, Lignosulfonates, Sloka pulp and paper mill(Latvia), USSR.

The total lignin content in the waters of the Lielupe river in the area where effluents from the Sloka pulp and paper mill (Latvia) are discharged varies from 4 to 40 mg/liter. The increase in the 5-day BOD of the river water caused by lignosulfonic acids is 0.46-1.76 mg oxygen/liter, depending on the degree of dilution of the effluents by the river water. The annual downstream degree of river self-purification from total lignin, as well as from lignosulfonic acids and lignosulfonates,

averages about 50%, and fluctuates between 25% and 74%. The rate constant for down-stream self-purification from total lignin fluctuates from 0.0120 to 0.0800 during the course of a year. The values most frequently obtained are 0.0300-0.0450. Bacterial oxidation of total lignin and lignosulfonic acids took place more rapidly under natural conditions than in the laboratory. Water temperature had a smaller effect on oxidation under natural conditions than in the laboratory. (Stapinski-IPC)
W76-10835

LONG-TERM STABILITY OF WASTE LIGNINS IN AQUATIC SYSTEMS. PART 2. STABILITY IN SALINE WATER,
Swedish Water and Air Pollution Research Laboratory, Stockholm, Sweden.
H. O. Bouveng, and P. Solyom.
Svensk Papperstidning, Vol. 79, No. 7, p 224-228, April 25, 1976. 6 fig, 2 ref, 4 tab.

Descriptors: *Lignins, *Biodegradation, *Sea water, *Pulp wastes, *Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, Sulfite liquors, Freshwater, Degradation(Decomposition), Stability, Saline water, Organic compounds, Flocculation, Sedimentation, Sorption, Sediments, Chlorination, Color, Carbon, Aquatic environment, Pine trees.
Identifiers: Spruce trees(Picea), Spent pulping liquors, Black liquor(Kraft-process), Kraft mills, Lignosulfonates, Chlorolignin.

Calcium-base spruce spent sulfite liquor, pine kraft black liquor, and effluents from the chlorination and alkaline extraction stages of pine kraft pulp bleaching were used to investigate the biodegradability of waste lignins in sea water. Tentative conclusions reached are as follows: The effluents of chemical pulp mills contain 2 organic fractions, viz., one readily biodegraded and one degraded only slowly or not at all (called 'waste lignin'). The ratio of these 2 fractions differs from one type of effluent to another, and may even differ between samples from the same type of effluent. The degradation of different waste lignins may differ in fresh vs. saline water. Any disappearance of waste lignin is due to a true degradation, not to flocculation/sedimentation or sorption by sediments. Kraft-process waste lignin, although almost completely degraded in freshwater, leaves a significant amount of a virtuall inert fraction in sea water. Conversely, the lignin dissolved during kraft pulp chlorination is degraded more readily in sea water than in freshwater. In general, a relatively larger fraction seems to remain undegraded in freshwater than in sea water, suggesting that certain structural elements of lignin are less amenable to degraation in freshwater. No direct correlation was noted between changes in dissolved organic carbon and in color. (See also W76-03078) (Brown-IPC)
W76-10838

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. PART 2. COAGULATION CHARACTERISTICS OF HEMICELLULOSE (IN JAPANESE),
Tokyo University, Japan, Faculty of Agriculture,
For primary bibliographic entry see Field 5D.
W76-10839

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (3). DEGRADATION OF LIGNIN PREPARATION FROM WASTE LIQUOR OF OXYGEN-ALKALI PULPING (IN JAPANESE),
Nagoya University, Japan, Faculty of Agriculture.
For primary bibliographic entry see Field 5D.
W76-10840

LAND APPLICATION OF SEWAGE SLUDGE, III. NITRATE ACCUMULATION AND WHEAT GROWTH RESULTING FROM ADDITION OF SEWAGE SLUDGE AND WOOD WASTES TO SOILS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 5E.
W76-10841

SOURCES OF POLYCHLORINATED BIPHENYLS IN WISCONSIN,
Wisconsin Department of Natural Resources, Madison.
S. J. Kleinert.
Wisconsin Natural Resources Bulletin, Vol. 41, No. 1, p 12-13, January/February, 1976. 1 illus.

Descriptors: *Polychlorinated biphenyls, *Wisconsin, Water pollution, Pollutants, *Water pollution sources, Lakes, Lake Michigan, Municipal wastes, Industrial wastes, Pulp and paper industry, Fallout, Recycling, Solubility, Adsorption, Fibers(Plant), Fish, Electrical equipment, Capacitors, Power transformers, Natural streams, Metals, Metallurgy.
Identifiers: Iron and steel foundries, Aluminum foundries, Waste paper, Dielectrics.

This is a perspective on the polychlorinated biphenyl (PCB) problem in Wisconsin. Studies have confirmed the presence of PCBs in fish in Lake Michigan and other waters of the state. The Wisconsin Department of Natural Resources has found PCBs in municipal waste water treatment plant effluents and in effluents from iron and steel foundries, aluminum foundries, and paper mills recycling waste paper. Because their solubility in water is low, it is believed that most of the PCBs discharged from paper mills are adsorbed on fibers and particulate matter removed in mill waste water treatment systems. Discharges of PCBs from pulp and paper mills recycling waste paper will diminish as the mills meet discharge permit requirements. The electrical industry also uses PCBs as dielectric fluids in some capacitors and transformers. Proper disposal and handling of these fluids and defective equipment are necessary to prevent their release to the environment. Fallout from the air is listed as another source of PCBs entering the environment. (Witt-IPC)
W76-10844

A TRANSFORMATIONS OF SULFATE TURPENTINE IN NATURAL WATERS (PROTSESSY PREVRASHCHENIYA SUL'FATNOGO SKIPIDARA V PRIRODNYKH VODAKH),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
T. P. Churilova, N. F. Troyan, and L. I. Nomikos.
Gidrokhimicheskie Materialy, Vol. 61, p 88-95, 1974. 9 fig, 12 ref, 2 tab.

Descriptors: *Organic compounds, *Natural streams, *Oxidation, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Water properties, Water chemistry, Microorganisms, Light intensity, Chemical reactions, Bacteria, Color, Water quality, Water temperature, Nitrates, Alcohols, Organic acids, Amino acids, Phenols.
Identifiers: *Sulfate turpentine, Aldehydes, Ketones, Esters, Lake Baikal(USSR).

The rate of sulfate turpentine oxidation in natural waters, the oxidation products, and the effect of these products on the properties and chemical composition of water and its microflora were studied in the laboratory using freshly distilled sulfate turpentine and water from Lake Baikal. The oxidation rate was determined in samples of lake water containing 0.5, 1.0, and 5.0 mg turpentine/liter. The samples were exposed to diffuse daylight (1000 lux, corresponding to illumination of the surface of the lake during the summer); to 100 lux (conditions of summer illumination at a depth of 10-20 m); and in darkness (conditions at 50 m depth and more). The temperatures were 16-18 C, 8-10 C, and 2-4 C, respectively. The rate of sulfate turpentine oxidation dropped sharply at low temperature and in darkness. It was the highest under conditions of full illumination. Turpentine remained unchanged in samples kept in the dark at 2-4 C for 5 days. The oxidation products included aldehydes, ketones, alcohols, esters, resinous substances, phenols, and carboxylic and amino acids. Oxidation of sulfate turpentine in natural water caused its discoloration and increased its content of organic substances, nitrates, the total numbers of bacteria, and the numbers of saprophytic bacteria. (Stapinski-IPC)
W76-10845

EFFLUENTS FROM CHLORINATION AND ALKALINE EXTRACTION OF PINE SULFATE PULP,
Swedish Forest Products Research Lab., Stockholm.
C. J. Alfthan, H. Norrstrom, and G. Akerlund.
Svensk Papperstidning, Vol. 79, No. 6, p 180-186, April 10, 1976. 12 fig, 9 ref, 3 tab.

Descriptors: *Bleaching wastes, *Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Color, Temperature, Chlorination, Pine trees, Effluents, Organic loading.
Identifiers: *Kraft mills, Alkaline extraction, Kraft pulping, Kappa-number, Chlorine dioxide.

In a modern bleached kraft pulp mill, the effluents from the first two bleaching stages (chlorination and alkaline extraction) are the most serious water polluters. The effects of different unbleached pulp grades and of changed reaction conditions in these bleaching stages on the polluting character of effluents have been studied, considering only those operating conditions likely to be of commercial practicality. Prolonging the kraft cook to a lower than normal kappa-number led to a lower 7-day BOD and less color in the two effluents. On the other hand, raising the temperature and the chemical charge in the bleach plant dissolved more organic matter and increased the pollutant load of effluents (in terms of BOD and color). Adding chlorine dioxide to the chlorination stage reduced the pollution load by 10-20%, both under normal and extreme conditions. (Brown-IPC)
W76-10858

THE USE OF WASTE FIBERS AS ABSORPTION MATERIAL IN GRASS SILAGE,
Finnish Pulp and Paper Research Inst. Helsinki.
For primary bibliographic entry see Field 5E.
W76-10863

POLYCYCLIC AROMATIC COMPOUNDS IN NATURE,
Woods Hole Oceanographic Institution, Mass.
M. Blumer.
Scientific American, Vol. 234, No. 3, p 34-45, March, 1976. 13 illus.

Descriptors: *Aromatic compounds, *Environment, *Water pollution sources, Soils, Sediments, Grasslands, Forests, Burning, Coals, Oil, Oil spills, Wastes, Industrial wastes, Organic compounds, Pollutants, Organic matter.
Identifiers: Wood.

The occurrence and origin of polycyclic aromatic compounds in nature are discussed. Polycyclic aromatic molecular structures are formed whenever organic substances are exposed to high temperatures. It is suggested that the compounds found in soil and young marine sediments may have been formed by forest and prairie fires. This class of compounds also enters the environment from the incomplete combustion of wood, coal, and petroleum, and from the spillage of petroleum. (Buchanan-IPC)
W76-10865

ELECTROCHEMICAL PRODUCTION OF FREE RADICALS FOR WASTEWATER TREATMENT,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-10876

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10877

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 849, $9.25 in paper copy, $3.00 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 76-203, July 1976, 286 p.

Descriptors: *Agricultural runoff, *Bibliographies, *Farm wastes, *Feed lots, Waste disposal, Waste treatment, Water pollution sources, Water pollution control, Runoff, Path of pollutants.

This report, containing 187 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included. The first volume (See W72-05840) was issued in January 1972 and covered the material announced in SWRA from October 1968 through December 1971. This volume covers the period from January 1972 through April 1976.
W76-10879

PARTICLE EMISSIONS FROM A LARGE KRAFT PAPER MILL AND THEIR EFFECTS ON THE MICROSTRUCTURE OF WARM CLOUDS,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 5A.
W76-10904

DISPERSION OF POLLUTANTS,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Sciences.
E. R. Reiter.
In: Proceedings from a Workshop on Inadvertent Weather Modification held August 13-31, 1973, Utah State University, Logan, p 157-187. 15 fig, 4 tab, 7 ref.

Descriptors: *Pollutants, *Dispersion, *Industrial wastes, *Air pollution, Industries, Mills, Powerplants, Winds, Cooling towers, Atmosphere, Stability, Measurement, Sampling, Chemistry of precipitation, Rainfall, Fallout, Path of pollutants, Sites, Meteorology.

The ever-increasing demand for our natural resources will bring about the development of more and more industrial plants which, only a few years ago, might have been deemed economically marginal, at best. Typical examples are the upsurge in the gold-mining industry, and the feasibility studies concerned with oil shale exploitation. Many of our newly developing industrial enterprises require the preparation of Environmental Impact Statements. A large proportion of these impact statements is concerned with aspects of air pollution. This discussion concentrated upon those aspects of the atmospheric environment which are fundamental to most air pollution problems. These problems as they arise from industrial siting, construction, and operation, were categorized as follows: (1) short-term effects of pollution, (2) long-term effects of pollution, (3) large-scale pollution problems, and (4) data and measurement requirements. (See also W76-10901) (Sims - ISWS)
W76-10907

PULSED DISPERSION OF TRACE CHEMICAL CONCENTRATIONS IN A SATURATED SORBING POROUS MEDIUM,
Oregon State Univ., Corvallis. Dept. of Statistics; and Oregon State Univ., Corvallis. Dept.of Mathematics.
F. T. Lindstrom.
Water Resources Research, Vol. 12, No. 2, p 229-238, April 1976. 5 fig, 22 ref. U. S. PHS ES-00040.

Descriptors: *Dispersion, *Mathematical models, *Distribution patterns, Saturated flow, Sorption, Porous media, Equations, Soil water, Theoretical analysis, Graphical analysis, Computers, Water chemistry, Trace elements, Mass transfer, Laplaces equation, *Path of Pollutants.
Identifiers: *Trace chemical concentrations, Pulsed dispersion, Free phase, Sorbed phase, Transport equations, Gaussian distribution.

A rather simple, yet complete, mathematical model for the pulsed dispersion of trace chemical concentrations in a water-saturated sorbing porous medium was stated, and the resulting integrodifferential equation of transport was solved via Laplace transform methods. A typical example of a soil water dispersion system was discussed with the aid of free and sorbed phase concentration distribution curves. (Visocky - ISWS)
W76-10915

LONGITUDINAL DISPERSION FOR FLOW OVER ROUGH BEDS,
New Brunswick University, Fredericton. Dept. of Civil Engineering.
N. D. A. El-Hadi, and K. S. Davar.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings Paper 12049, p 483-498, April 1976. 9 fig, 2 tab, 24 ref, 2 append.

Descriptors: *Dispersion, *River beds, Bed load, Beds, Roughness(Hydraulic), Roughness coefficient, Channel flow, Hydraulics, Waste identification, *Path of pollutants.
Identifiers: Relative roughness, Bedload movement, Bed roughness, Dispersion process.

The longitudinal dispersion coefficient was evaluated on the basis of a one-dimensional analysis as affected by large bed roughness in a laboratory flume. The experimental results have shown that the dimensionless dispersion coefficient is a function of the relative roughness height and the relative roughness spacing. It was also found that dimensionless dispersion coefficient reaches a maximum value at a roughness density 0.111. The commonly used equation for estimating the longitudinal dispersion coefficient was also examined. It was found that this straight line relation between the longitudinal dispersion coefficient and the product of water depth and the bed shear velocity is no longer valid for this product greater than 0.1 sq ft per sec. (Lee - ISWS)
W76-10921

WATER QUALITY CHARACTERISTICS OF THE ILLINOIS RIVER AT PEORIA,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5A.
W76-10922

DEPOSITION IN UPPER PATUXENT ESTUARY, MARYLAND, 1968-1969,
Madison Coll., Harrisonburg, Va. Dept. of Geology.
For primary bibliographic entry see Field 4C.
W76-10925

MONSOONAL DEPOSITION OF SEA SALT AND AIR POLLUTANTS OVER BOMBAY,
Bhabha Atomic Research Centre, Trombay, Bombay (India). Air Monitoring Section.
R. Sequeira.
Tellus, Vol. 28, No. 3, p 275-282, 1976. 2 fig, 5 tab, 21 ref.

Descriptors: *Rainfall, *Air pollution, *Salts, *Asia, Monsoons, Pollutants, Rain, Rain water, Precipitation(Atmospheric), Sampling, Chemistry, Chemicals, Calcium, Hydrogen ion concentration, Salinity, Industrial wastes, Meteorology, *Path of pollutants.
Identifiers: *Bombay(India), India, *Sea salt.

Representative sampling of rainwater was carried out in Greater Bombay and its neighborhood during the southwest monsoon period of 1974. It was estimated that on the average, approximately 200 kg/ha sea salt is deposited each monsoon. A high 'excess' of calcium was observed throughout Bombay, including relatively unpolluted places. The source of this excess was seen to be nonmarine. The mean pH, ionic balance, and salinity of rainwater was used to characterize different areas of Bombay in varying degrees of pollution. (Sims-ISWS)
W76-10932

THE IMPACT OF HIGHWAY CONSTRUCTION ON A NORTH FLORIDA WATERSHED,
Michigan State Univ., East Lansing. Inst. of Water Research.
T. M. Burton, R. R. Turner, and R. C. Harriss.
Water Resources Bulletin, Vol. 12, No. 3, p 529-538, June 1976. 5 tab, 15 ref.

Descriptors: *Highways, *Water quality, *Florida, Watersheds(Basins), Turbidity, Construction, Suspended solids, Phosphorus, Erosion control, Soil erosion, Sediments, Sampling, On-site investigations.
Identifiers: *Highway construction, *Tallahassee(Fla), *Meginniss Arm Tributary(Fla), Dissolved silicon, Control basins, Electrical conductivity, Chemical transport.

A 20-month study of some effects of highway construction on water quality was conducted during construction of Interstate 10 at Tallahassee, Florida. Highway construction resulted in significant increases in turbidity, suspended solids, total phosphorus, and dissolved silicon in downstream waters despite use of recommended procedures for erosion control. Highway construction did not result in significant increases in dissolved phosphorus or nitrogen. Although higher losses of sediment have been reported in the literature, the losses from this watershed were still sufficient to cause extensive problems in Lake Jackson, a 1620 ha downstream ecosystem. Turbidities reached over 500 Jackson Turbidity Units in the southern half of the basin following an unusually rainy period when over 40 cm of rain fell in a three to four week period. (Roberts - ISWS)
W76-10945

A TWO-DIMENSIONAL NUMERICAL MODEL OF ESTUARINE CIRCULATION: THE EFFECTS OF ALTERING DEPTH AND RIVER DISCHARGE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.
For primary bibliographic entry see Field 2L.
W76-10948

SOME WATER QUALITY ASPECTS IN A NASCENT IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria. Water Quality Section.
V. Kothandaraman, and R. L. Evans.
Transactions of the Illinois State Academy of Science, Vol. 68, No. 3, p 292-303, September 1975. 5 fig, 4 tab, 4 ref.

Descriptors: *Early impoundment, *Water quality, *Impoundments, *Chemical properties, *Physical properties, *Illinois, Water analysis, Chemical analysis, Water chemistry, Nutrients, Reservoir storage, Impounded waters, Eutrophication, Water temperature, Stratification, Seasonal, Analytical techniques, Chlorides, Sulfates, Dissolved oxygen, Sampling, Water temperature.
Identifiers: *Nascent impoundments, Lake Evergreen(Ill), Six-Mile Creek(Ill), Mineral quality, Dissolved minerals.

A detailed 3-year study was performed to delineate the water quality aspects of the newly created Lake Evergreen. Some physical and chemical characteristics of the impoundment and its major tributary, Six-Mile Creek, were examined. An effort to detect significant relationships between the waters of a free-flowing stream and the impoundment of the waters was not productive. Dissolved oxygen stratification suggests that man-made impoundments may be 'old', limnologically speaking, from the day of their creation. (Henley - ISWS)
W76-10950

DESIGN OF ALTERNATING DIFFUSER PIPES,
Skopje Univ. (Yugoslavia).
For primary bibliographic entry see Field 8B.
W76-10952

A MODEL FOR WATER AND PHOSPHORUS DISTRIBUTION ON THE ISLAND OF GOETEBORG, (IN SWEDISH),
Uppsala Univ. (Sweden).
E. Eriksson, and H. Peippo.
Vatten 31(2); p 106-119, 1975.

Descriptors: *Path of pollutants, *Model studies, Europe, *Distribution patterns, *Phosphorus, Estuaries, Clays, Rivers, Sewage, Suspended solids.
Identifiers: *Sweden(Goeteborg Island).

A fairly simple compartment model of a typical estuary, River Gota Alv (Sweden) and adjacent coastal parts, based on data on salinity distribution and river discharge and supported by actual observations of currents in the area is presented. The fluxes of water between compartments are computed on the basis of conservation of water and salinity. When these fluxes are used with average total P concentrations and known sources of P from land, the fate of P added to the river can be studied. A great deal is apparently precipitated when freshwater with suspended clay mixes with seawater. If the precipitated amounts are assumed to be proportional to concentrations, the P status in the water at various alternatives of release of treated sewage water in the river can be simulated. Estuaries are probably important sink areas for P, not only in muddy freshwater but also for P in ocean water mixing with freshwater in estuaries.--Copyright 1976, Biological Abstracts, Inc.
W76-10963

A BIOLOGICAL STUDY ON THE POLLUTION OF THE SAI-GAWA RIVER AND ITS TRIBUTARIES, ISHIKAWA PREFECTURE, (IN JAPANESE),
Kanazawa Univ. (Japan). Biology Inst.
H. Kamijo, and T. Watanabe.
Jpn J Limnol 36(1), p 16-22, 1975.

Descriptors: Asia, Water pollution, Rivers, Tributaries, Biota.
Identifiers: *Japan(Sai-gawa river).

The pollution of water was studied using attached organisms on the submerged stones in the Saigawa River and its 2 tributaries, the Fushimi-gawa and Juhnin-gawa Rivers (Japan). Both the tributary streams are polluted by industrial and other wastes (alpha-mesosaprobic to beta-polysaprobic). A noticeable difference in the degree of pollution as assessed by the biota is found between the upper and lower surface of the submerged stones. Using their upper surface, the degree of pollution is smaller in the upper reaches of the Sai-gawa River than at the junction of the 2 tributaries. That of the under surface indicates that the pollution progresses from the bottom layer of water. Below the junction of the 2 streams, the pollution becomes heavier and the difference between the upper and lower surfaces of the submerged stones is not as great as in the upper reaches.--Copyright 1976, Biological Abstracts, Inc.
W76-10973

UPTAKE, TRANSLOCATION AND ELIMINATION OF INDIVIDUAL CHLOROBIOPHENYLS BY OYSTERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-11000

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-11007

THE OCCURANCE AND AMOUNT OF PELAGIC TAR IN THE OPEN OCEAN,
J. N. Butler.
In: Background Papers for a Workshop on Inputs, Fates and Effects of Petroleum on the Marine Environment, Vol. II, May, 1973. p. 375-399, 1 tab., 8 fig., 26 ref.

Descriptors: *Oil, *Oil water, :Oceans, Water quality, Surface waters, Atlantic Ocean, Gulf of Mexico, *Oil spills, Water pollution, *Path of pollutants.
Identifiers: Mediterranean Sea, Caribbean Sea *Pelagic tar lumps, Canary Current, North Equatorial Current, Sargasso Sea.

Observations of pelagic tar lumps on the open ocean have been made consistently since 1965, and quantitative measurements have been made since 1969 in a number of areas of the Mediterranean Sea, Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. The amount of pelagic tar may vary from less than 0.1 mg/m2 to over 500 mg/m2 depending on the location. Variations of a factor of 10 in samples taken at the same location at the same time are not unusual. The largest amounts of tar are found in the central Mediterranean, the Canary Current, the North Equatorial Current, and the Sargasso Sea. In the Caribbean, Gulf of Mexico, and the coastal areas of North America, the levels appear to be more than a factor of ten lower than in the Sargasso Sea. (See also W76-11007) (Katz)
W76-11008

SOME MECHANISMS OF WEATHERING OF PETROLEUM HYDROCARBONS ON MARINE WATERS: COMPETITIVE PATHWAYS TO FATE AND DISPOSITION OF PETROLEUM POLLUTION,
M. H. Feldman.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 431-450, 7 tab., 1 fig., 38 ref.

Descriptors: *Oily water, *Oil pollution, *Oil spills, *Weathering, Determination, *Aging, *Temperature, *Light, Physical, Detritus, Weather effects, Photoactivation, Sedimentation, Marine waters.
Identifiers: Photosynthesis, *Petroleum hydrocarbons, Trace materials, Trace material interactions.

Weathering of petroleum hydrocarbons which are spread on the sea changes the character of these substances. Among weathering mechanisms discussed are photolysis, trace material interactions on the surface layers and sedimentation processes. (See also W76-11007) (Katz)
W76-11010

THE SURFACE ACTIVITY OF PETROLEUM AND ITS INFLUENCE ON THE BEHAVIOR OF OIL AT SEA,
W. P. Garret.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 451-461, 1 tab., 1 fig., 7 ref.

Descriptors: *Oily water, *Oil pollution, *Oil spills, *Weathering, *Oil-water interfaces, *Evaporation, Marine waters, Organic matter, Marine organisms, Chemical wastes, Boundary processes, Environmental effects, Polarity.
Identifiers: *Polar-active constituents, *Spreading, *Oil surface-to-volume ratio, *Semi-solid residues, Tars.

The polaractive constituents of petroleum which are responsible for spreading enhance the weathering process by increasing the surface to volume ratio of the oil, thereby producing a greater exposure to air and underlying water. Modification of fluid petroleum to form non-fluid or semi-solid residues is due primarily to spreading and evaporative processes, although other chemical, physical and biological factors are operative to a lesser extent. (See also W76-11007) (Katz)
W76-11011

SEDIMENTATION PROCESSES INVOLVING HYDROCARBONS IN THE MARINE ENVIRONMENT,
C. D. Gebelein.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 462-474, 20 ref.

Descriptors: *Oily water, *Oil pollution, *Marine environment, *Sedimentation, *Weathering, *Evaporation, *Absorption, *Adsorption, Oil water, Boundary processes, Deterioration, Sedimentation rates, Underwater, Coasts, Mud-water interface.
Identifiers: *Tar balls, *Oil slicks, *Low energy, *Shorelines, Liquid hydrocarbons.

Deposition of oil in subtidal environments involves an increase in the density of oil sufficient to allow it to sink to the bottom. Processes leading to increased density include (a) modification of slicks by evaporation and dissolution of lighter materials, (b) uptake of particulate matter by the oil, (c) agglutination of dispersed particles, and (d) adsorption of dissolved species into particulate matter. (See also W76-11007) (Katz)
W76-11012

CHEMICAL COMPOSITION: A CONTROL ON THE PHYSICAL AND CHEMICAL PROCESSES ACTING ON PETROLEUM IN THE MARINE ENVIRONMENT,
C. B. Koons.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 475-484.

Descriptors: *Marine environment, *Weathering, Determination, *Evaporation, *Physical proper-

ties, Chemical analysis, Oily water, Oil pollution, Marine waters, Oil spills, Oil-water interfaces, Chemical wastes, Environmental effects, Aquatic microbiology, Microbial degradation, Marine microorganisms, Absorption.
Identifiers: *Tar balls, *Saturated hydrocarbons, Aromatic hydrocarbons, Polar compounds.

The chemical composition of petroleum or petroleum products released into the marine environment by spills, chronic low-level discharges, or by natural seepages controls to a very large extent the processes, both physical and chemical, which transform the petroleum material. Physical processes (evaporation, solution, and absorption) are most important during the period just following the release of oil into the marine environment. Chemical (autooxidation) and biological (microbial degradation) processes, in contrast, are long-range and become increasingly important as time goes on. Tar balls or lumps found in the open ocean and on beaches are weathered products of petroleum or petroleum products. Analytical chemical studies of these tar balls provide excellent information on the source, degree of weathering, and relative importance of different weathering processes. (See also W76-11007) (Katz)
W76-11013

BIOLOGICAL FATE OF PETROLEUM HYDROCARBONS IN AQUATIC MACROORGANISMS,
For primary bibliographic entry see Field 5C.
W76-11014

MICROBIAL INTERACTION WITH OIL IN THE MARINE ENVIRONMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W76-11015

SOME REFLECTIONS ON THE BIODEGRADATION OF MINERAL OILS IN THE MARINE ENVIRONMENT,
Biologische Anstalt Helgoland (West Germany).
W. Gunkel.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973, p. 516-540, 1 tab, 48 ref.

Descriptors: *Marine environment, *Laboratory techniques, *Microbial degradation, *Deterioration, *Modes of action, *Oxygen demand, *Nutrients, *Nitrogen, *Phosphorous, Marine microorganisms, Oil spills, Water pollution, Microbiology, Oil-water interactions, Oil pollution, Persistence, Laboratory studies.
Identifiers: Oil decomposing bacteria, Hydrocarbon clastic microorganisms, Oil slicks.

The main problems in the pursuit of knowledge regarding the biodegradation of mineral oils in the marine environment are outlined. The difficulties of experimental studies on microbial degradation and the factors that limit oil decomposition are discussed. (See also W76-11007) (Katz)
W76-11016

FATES OF PETROLEUM IN THE SEA: BIOLOGICAL ASPECTS,
For primary bibliographic entry see Field 5C.
W76-11017

OIL IN THE MARINE ENVIRONMENT,
B. H. Ketchum.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 709-738, 4 tab., 32 ref.

Descriptors: *Oil, *Oil pollution, *Marine environment, *Marine biota, *Regulations, *Management, Legislation, Water policy, *Oil spills, Marine microorganisms, Water pollution effects, Toxicity.
Identifiers: *Oil spill prevention, Oil slick, Oil persistence, Petroleum hydrocarbons.

A general review is presented of oil pollution in the marine environment, and specific recommendations for procedures to be followed to minimize damage to the marine biota are listed. Additional suggestions to protect marine wildlife are also listed. (See also W76-11007) (Katz)
W76-11025

THE IMPORTANCE OF OIL POLLUTION IN THE NORTH SEA,
P. Korringa.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 739-743.

Descriptors: *Oil pollution, *Water pollution effects, *Marine organisms, Toxicity, Atlantic Ocean, *Marine environment, *Benthic organisms, *Oil spills.
Identifiers: *North Sea, *Torrey Canyon disaster, Behavior of oil, Chemical control, Sinking of oil.

Oil pollution in the North Sea is discussed, with emphasis on the behavior of oil in the sea and the biological effects of oil in the marine environment. The hazards of chemicals used to clean up oil spills are emphasized. (See also W76-11007) (Katz)
W76-11026

POLYNUCLEAR AROMATIC HYDROCARBON POLLUTION OF THE MARINE ENVIRONMENT,
M. J. Suess.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 801-808, 18 ref.

Descriptors: Oil, *Oily water, *Oil pollution, *Marine environment, *Phytoplankton, *Industrial wastes, Marine flora, Productivity, Chemical wastes, Sewage, Water pollution sources, Oil spills.
Identifiers: *Polynuclear aromatic hydrocarbons, Aliphatic hydrocarbons, Aromatic hydrocarbons, Carcinogens, 3-4 Benzpyrene.

Many polynuclear aromatic hydrocarbons are present, at least in minute concentrations in all marine waters, most probably because they are produced by aqueous flora. Coastal waters are continuously being further polluted with PAH from municipal and industrial effluents, atmospheric precipitation and fallout, runoff, and oil spillage in harbors and from ships. (See also W76-11007) (Katz)
W76-11030

NATURE AND BEHAVIOR OF MANURE,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
J. R. Miner.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 8 p.

Descriptors: *Farm wastes, *Water pollution sources, *Feed lots, *Runoff, Odor, Organic matter, Biochemical oxygen demand, Chemical oxygen demand, Nutrients, Microorganisms, Hogs, Gases, Confinement pens, *Path of pollutants.

This outline was prepared as a study aid to the registrants at the Iowa State University Animal Waste Management Conference. Major topics outlined are: (1) Manure as a potential water pollutant, (2) Feedlot runoff, and (3) Odors. (See also W76-11032) (Cartmell-East Central)
W76-11038

WASTE APPLICATION TO SOILS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11042

BEEF CATTLE FEEDLOTS: IMPACT ON UNDERLYING SOIL,
Agricultural Research Service, Ft. Collins, Colo.
F. A. Norstadt, and H. R. Duke.
In: Proceedings of the 87th Annual Research Conference, Colorado State University, Fort Collins, Colorado, Number 218, p. 86, 1974.

Descriptors: *Soil profiles, *Groundwater, *Feed lots, Air pollution, Water pollution, *Farm wastes, Soils.
Identifiers: Manure pack.

Studies on commercial and experimental installations were made to determine changes in soil profiles and ground water beneath earth-surfaced beef cattle feedlots. The kinds and amounts of soil gases as well as the chemical constituents of the soil solutions are influenced by the depth and water content of a manure pack and seasonal soil temperatures. An experimental feedlot has been built to evaluate schemes to minimize both air and water pollution. A feedlot, with intact manure pack and under continuous use at a sufficient stocking rate, does not appear to be a pollution hazard to soil and underground water. (Cameron-East Central).
W76-11047

SEEPAGE LOSS FROM HOLDING PONDS,
Soil Conservation Service, Temple, Tex.
W. B. Moody.
In: Soil Conservation Service Texas Tech University Workshop Committee on Feedlot Waste, Texas Tech University, Lubbock, July 28-29, 1971, 34 p, 3 fig.

Descriptors: *Seepage control, *Permeability, Soil analysis, Darcys law, *Lagoons, Groundwater, Water pollution sources, Bedrock, Soil water movement.
Identifiers: *Holding ponds.

Detailed calculations are given for a typical analysis of seepage losses from a proposed pond. Such losses may be estimated following an investigation of soil and bedrock characteristics and laboratory testing of the soils. Construction and protection of relatively impervious blankets are discussed. (East Central)
W76-11051

LYSIMETER STUDIES WITH LONG TERM APPLICATION OF SWINE LAGOON EFFLUENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. L. Parker, J. Wang, M. R. Overcash, and F. J. Humenik.
Presented at the 67th Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-4036, 13 p. 10 tab.

Descriptors: *Lagoons, *Effluents, *Application rates, *Lysimeters, *Nitrogen, *Phosphorus, Oxygen demand, *Hogs, Water pollution sources, Path of pollutants, *Farm wastes.
Identifiers: Organic carbon.

The application of swine waste lagoon effluent to lysimeters exposed to weather conditions up to a hydraulic rate of 1 inch per week and a process load of about 3000 lbs. nitrogen/acre/year continuously for over two years has resulted in essentially complete removal of phosphorus and excellent reduction of oxygen demand and organic carbon. Investigation of lysimeters with water table control showed that additional nitrogen reduction, specifically lower nitrate concentrations, can be achieved without supplemental carbon addition

and with no decrease in the associated removal of organic carbon and oxygen demand. Removals of organics and nitrogen were reduced when the soil surface remained saturated either due to poor infiltration or control of the water table too near the soil surface. It was determined that controlled denitrification could provide for nitrogen reduction of soil water, and if the land disposal site were properly located and managed, a significant lowering of groundwater nitrate concentrations could be obtained before the flow left the owners property. (Cartmell-East Central)
W76-11055

EFFECT OF A LIVESTOCK WINTERING OPERATION ON A WESTERN MOUNTAIN STREAM,
Montana State Univ., Bozeman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-11059

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
C. M. Mohr, and P. J. O'Brien.
In: Second International Symposium on Underground Waste Management and Artificial Recharge, September 26-30, 1973. New Orleans, Louisiana, p 731-737, 3 fig.

Descriptors: *Waste disposal, *Chemical degradation, *Deep wells, *Mathematical models, Groundwater basins, Aquifer characteristics, Cost analysis, Groundwater, Arid climates, Industrial wastes, *Decision making, Underground waste disposal.
Identifiers: *Waste management, Economics of waste disposal, Subsurface environment, *Deep-Well disposal, Decision model, Individual disposal wells, Centralized disposal wells, Transportation costs, Decision mapping.

Serious concern must be given to the degrading effects on the subsurface environment of deep-well disposal. Detailed investigations must be made of possible geohydrologic basin sites before injection of waste materials begin. Deep-well disposal is usually the least expensive disposal method when compared to high-temperature incineration, encapsulization and others. The comparison of individual disposal wells versus centralized disposal wells must be considered. The economic advantages of centralized processing must be balanced against transportation costs of wastes to the centralized facility. An optimal configuration of the centralized system depends on these costs. An additional advantage of centralized waste disposal is the greater effectiveness with which local, state, and federal development and operating regulations may be enforced. A general mathematical model expressed in terms of a decision map indicates the optimal configuration to serve distributed sources of waste. Application of this model provides input to the waste-management authority to help integrate the data with environmental factors to produce a final recommendation. (See also W74-03222) (Heiss-NWWA)
W76-11063

GROUND WATER QUALITY MONITORING FOR CALIFORNIA'S NEEDS,
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5A.
W76-11065

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Pascale.
Available from the National Technical Information Service Springfield, Va 22161, as PB-254 507, $4.50 in paper copy, $3.00 in microfiche. Water-Resources Investigations 76-1, February 1976. 42 p, 16 fig, 5 tab, 12 ref.

Descriptors: *Monitoring, *Waste disposal, *Injection wells, *Path of pollutants, *Groundwater, *Florida, Aquifer characteristics, *Waste disposal wells, Hydraulic conductivity, Transmissivity, Limestone, Porosity, Sampling, Data collections, Hydrologic data, Test wells.
Identifiers: Northwest Florida.

Two test wells were constructed by the U. S. Geological Survey into an injection zone at site 1, 22 miles east and site 2, 17 miles northeast of an active injection system to monitor the injection zone and to provide additional data for evaluating the regional effects of deep-well waste injection. Test wells 1 and 2 are cased to a depth of 1,220 ft and 985 ft below land surface and are completed open hole in limestone to 1,500 ft and 1,290 ft, respectively. Total porosity of the lower limestone was 21 percent at test well 1 and 18 percent at test well 2; effective porosity was 13 and 14 percent, respectively. Calculated values of transmissivity ranged from 3,530 to 5,040 ft squared per day at test well 1 and from 232 to 519 ft squared per day at test well 2. All major chemical constituents of water in the lower limestone of the Floridan aquifer were in greater concentrations in test well 1. Water at test well 2 was fresh and contains dissolved solids and chloride in concentrations of less than 1,000 and 330 mg/liter, respectively. Water level was 65 ft above sea level in test well 1, and 118 ft in test well 2. (Woodard-USGS)
W76-11070

MODELING SOLUTE TRANSPORT IN GROUND WATER,
Geological Survey, Denver, Colo.
L. F. Konikow.
Reprint from International Conference on Environmental Sensing and Assessment, Volume 2, Technical Session 20-3, held in Las Vegas, Nevada, September 14-19, 1975: Institute of Electrical and Electronics Engineers, Inc., 1976. 6 p, 7 fig, 18 ref.

Descriptors: *Path of pollutants, *Groundwater, *Model studies, *Computer models, Groundwater movement, Water pollution sources, Hydrologic data, Hydrogeology.
Identifiers: *Solute-transport models.

A solute-transport model has been developed to predict the movement of dissolved chemicals in flowing ground water. The model accurately reproduced the observed 30-year history of contamination at the Rocky Mountain Arsenal, Colorado, where liquid industrial wastes seeped out of unlined disposal ponds and spread for many square miles in an underlying alluvial aquifer. The computer model was developed by coupling a finite-difference solution to the ground-water flow equation and the solution to the solute-transport equation using the method of characteristics. (Woodard-USGS)
W76-11076

VARIATION IN CONCENTRATION OF SELECTED WATER-QUALITY CONSTITUENTS IN THE SACRAMENTO RIVER AT BEND BRIDGE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11078

WATER-QUALITY DATA FOR CANALS IN EASTERN BROWARD COUNTY, FLORIDA, 1969-1974,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-11081

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 8B.
W76-11084

DISPERSION OF DYED SEA-WATER DISCHARGED FROM MOVING VESSELS IN COASTAL WATERS,
Dobrocky Seatech Ltd., Victoria (British Columbia).
D. Farmer, and D. Lemon.
Institute of Ocean Sciences, Patricia Bay, Pacific Marine Science Report 75-3, August, 1975. 59 p, 15 fig, 15 ref.

Descriptors: *Dispersion, *Sewage effluents, *Continental Shelf, *Waste disposal, *Water pollution, *Dye dispersion, Ships, Coasts, Environmental effects, *Path of pollutants.
Identifiers: *Outer Continental Shelf, Ocean dumping.

This report consists of a summary of necessary theoretical background, which includes the development of a wake in a stratified fluid, and the spread of a passive, conservative scalar due to turbulent diffusion. It is followed by a description of the experiment and the treatment of the data. These observations are then compared to the theories and a predictive model based on the experimental results is chosen from the available theories. Finally, certain formulae which are intended to provide a predictive capability for application to problems of practical concern in coastal waters are derived. An appendix lists a recommended sequence of steps to be followed in applying the results of this report to particular pollution situations. (Sinha-OEIS)
W76-11086

BARIUM IN SOUTHERN CALIFORNIA COASTAL WATERS: A POTENTIAL INDICATOR OF MARINE DRILLING CONTAMINATION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W76-11089

DISTRIBUTION OF SUSPENDED OIL PARTICLES FOLLOWING THE GROUNDING OF THE TANKER ARROW,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
W. D. Forrester.
Journal of Marine Research, Vol 29, No 2, p 151-170, May 15, 1971. 5 fig, 3 tab, 2 ref.

Descriptors: *Continental Shelf, *Canada, *Oil spills, *Oil pollution, Water pollution sources, *Water pollution effects, Resources development, Water resources, Fossil fuels, Distribution, Dispersion, Model studies, *Path of pollutants, Bays.
Identifiers: *Outer Continental Shelf, Nova Scotia, Bunker oils, Chedabucto Bay, Tanker Arrow.

While taking oceanographic observations in Chedabucto Bay, Nova Scotia, following the grounding of the tanker ARROW on February 4, 1970, small (5 micron to 1 or 2 mm) oil particles were found in the water column. The particles were collected with plankton nets and water bottles. This paper discusses the origin of the particles, their distribution in size and in depth, and the transport of particles out of Chedabucto Bay into the open ocean. A simple steady-state model has been employed to relate turbulent-energy distribution to oil-particle distribution over corresponding ranges of wavelength and particle size. The particles were detected as far as 250 km from their source and provided evidence of a current flowing southwestward along the Nova Scotia Coast at a speed of about 8 km/day. (Sinha-OEIS)

W76-11096

OIL IN SEA ICE,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
E. L. Lewis.
Pacific Marine Science Report 76-12, June 1976. 26 p, 12 fig.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Sea ice, *Environmental effects, *Blowouts, Water resources, Resource development, Offshore platforms, Paths of pollution.
Identifiers: *Outer Continental Shelf, Environmental impacts, Offshore technology, Beaufort Sea.

Proposed industrial exploration in Canadian Arctic offshore waters made the rapid acquisition of environmental information concerning those waters essential. The most urgent need was to obtain data from the Beaufort Sea, north of the Mackenzie Delta, N.W.T., where oil companies are engaged in drilling exploratory wells from artificial islands and intend to move further offshore utilizing drill ships. Although modern drilling techniques make a large scale leakage of oil into the environment unlikely, such a possibility must be considered as it has been suggested by some authors that the consequences of even a few major oil spills could be very serious. At a less catastrophic level the biological effects of contamination of shoreline and feeding grounds of various mammals, birds and other creatures had to be assessed and this also required an understanding of the behaviour of crude oil in sea ice. Following a discussion on the formation and structure of sea ice, details are given on the movement of spilled oil from the sea bed to the sea surface, oil at the ice/water interface, the migration of oil through the ice, oil at the ice surface, and effects of blowouts. (Sinha-OEIS)
W76-11098

5C. Effects Of Pollution

PERIPHYTIC AND PLANKTONIC ALGAE OF THE LOWER FRASER RIVER IN RELATION TO WATER QUALITY CONDITIONS,
British Columbia Univ., Vancouver. Westwater Research Centre.
T. G. Northcote, G. L. Ennis, and M. H. Anderson.
Technical Report No. 8, November 1975. 61 p, 22 fig, 8 tab, 70 ref, 4 append.

Descriptors: *Water pollution effects, Aquatic environment, *Algae, Water quality, *Periphyton, *Phytoplankton, Sampling, Measurement, Diatoms, Chaldophora, *Pollutant identification, *Canada.
Identifiers: *Fraser River(Canada), Achnanthes minutissima.

Algae can be useful in assessing water quality conditions of rivers, and in some rivers algae form important parts of ecosystem. During 4 periods of early autumn, 1972, and late summer 1973, algal communities growing on wood surfaces (periphyton) along the river bank and suspended in the midstream surface water (phytoplankton) were sampled at 14 stations. Species composition, distribution, abundance, diversity, and total bimass of major groups were examined in relation to seasonal and spatial changes in water conditions, particularly discharge, temperature, turbidity, nutrients and chemical parameters. Diatoms were usually dominant in the attached group of algae (112 different species, of which 20 were common). Numbers ranged between 0.5 to 4.5 million cells/sq cm. Green algae (22 species, of which 11 were common) were the second most abundant group. Diatom cell densities appeared high in relation to other bodies of water, but would probably be lower on other substrates which were not sampled. Some algae specis, such as achnanthes minutissima, were widely distributed over the length of the river and are indicative of relatively unpolluted well-oxygenated systems. However the occurrence of Cladaphora glomerata in the lower-most reaches may indicate incipient problems due to excessive nutrient additions there. Diversity of periphyton species (15 to 30 species/station) was moderately high and characteristic of relatively unpolluted freshwater systems. None of the species known to be pollution tolerant was common in the Fraser, giving a very low Palmer pollution index rating. Diversity indexes of the phytoplankton generally between 2 and 3, are well above levels common in severely polluted streams. (Smith-North Carolina)
W76-10504

CHLORINATED HYDROCARBON RESIDUES IN FISHES FROM THE LOWER FRASER RIVER,
British Columbia, Vancouver. Westwater Research Centre.
N. T. Johnston, L. J. Albright, T. G. Northcote, P. C. Oloffs, and K. Tsumura.
Technical Report No. 9, November 1975. 31 p, 7 fig, 2 tab, 53 ref, append.

Descriptors: *Water pollution effects, *Polychlorinated biphenyls, Aquatic environment, Fish, *Fish toxins, *Pesticides, *DDT, Sampling, Measurement, Agricultural chemials, Dieldrin, Organic compounds, *Canada, *Chlorinated hydrocarbon pesticides, Pollutant identification.
Identifiers: *Fraser River(Canada), Organochlorine compounds.

At 14 stations along the lower Fraser, located to reflect the gradient in land use, fish species were regularly sampled betwen summer 1972 and autumn 1973. Concentrations of 11 common organochlorine compounds were measured in the tissues of 183 fish (representing 12 groups). It is not surprising that aldren, heptachlor and lindane were not present because of changes which these chemicals are known to undergo. However, the absence of alpha-chlordane and gamma-chlordane, which do not undergobiological degradation, indicates low inputs into the system. Other compounds which are known to accumulate in sediments were found in the fish tissues, as would be expected. In the case of dieldrin, its low levels (about 2 ppb) and infrequent occurrence (4 of 183 samples) are in contrast to results from most North American inland waters. p,p'-DDT and its metabolities were the most commonly occurring organochlorine compounds, found in over 80% of all specimens. However, levels of DDT seem low compared to other North American urban-agricultural regions. Polychlorinated binphenyls showed the highest concentrations of all compounds found in muscle tissues. In estuary areas frequency of occurrence and mean levels were higher in several species (rainbow trout, northern squawfish) than in the upstream portions of the river which probably reflects the role of urban Vancouver as a source of these compounds. Low levels of chlorinated hydrocarbons found in most fish suggest that these compounds do not present serious problems, though low level concentrations may impact eggs and young fish. The large volume of flow has contributed to low concentrations found. (Smith-North Carolina)
W76-10505

CHRONIC TOXICITY OF ATRAZINE TO SELECTED AQUATIC INVERTEBRATES AND FISHES,
EG and G, Bionomics, Wareham, Mass.
K. J. Macek, K. S. Buxton, S. Sauter, S. Gnilka, and J. W. Dean.
Report EPA-600/3-76-047, May, 1976, 49 p, 17 tab., 41 ref.

Descriptors: *Toxicity, *Bioassay, *Invertebrates, *Aquatic insects, Freshwater fish, *Brook trout, *Daphnia, *Pesticides, *Minnows, Methodology, Lethal limit, Water pollution effects, Sunfishes.
Identifiers: *Atrazine, Daphnia magna, Midge, Chironomus tentans, Scud, Gammarus fasciatus, Bluegill sunfish, Lepomis macrochirus, Fathead minnow, Pimephales promelas, Salvelinus fontinalis, Flowing-water bioassay, Maximum accepted toxicant concentration, MATC, Incipient LC50, Application factors.

Representatives of the aquatic invertebrate species of water flea (Daphnia magna), midge (Chironomus tentans), and scud (Gammarus fasciatus); and the fish species bluegill (Lepomis macrochirus), fathead minnow (Pimephales promelas), and brook trout (Salvelinus fontinalis) were chronically exposed to various concentrations of atrazine in separate flowing-water systems. Maximum acceptable toxicant concentrations (MATC) of atrazine for the selected species in soft water were estimated using survival, growth, and reproduction as indicators of toxic effects. The MATC was estimated to be between 0.11 and 0.23 mg/l for midges, between 0.14 and 0.25 mg/l for water fleas, and between 0.06 and 0.14 for the scud. The MATC was estimated to be between 0.09 and 0.50 mg/l for bluegills, between 0.21 and 0.52 mg/l for fathead minnows, and between 0.06 and 0.12 mg/l for brook trout. The incipient-LC50 for fishes and the 48-hour LC50 for invertebrates were estimated from acute exposures and were used to calculate application factors (MATC limits/LC50). For aquatic invertebrates and atrazine the estimated application factors were between 0.15 and 0.32 for midges, between 0.02 and 0.04 for water flea, and between 0.01 and 0.02 for scud. Application factors were estimated between 0.01 and 0.07 for bluegills between 0.01 and 0.03 for fathead minnows, and between 0.01 and 0.02 for brook trout. (Katz)
W76-10517

ECOLOGICAL VARIABILITY OF BREAM IN LITHUANIAN WATERS: 2. AGE AND GROWTH RATE, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parizitologii.
A. I. Orlova.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai. 2, p 113-125, 1974.

Descriptors: Lakes, Trophic levels, *Fish population, Fish reproduction, *Fish genetics, Diptera.
Identifiers: Abramis-Brama, *Bream, *Lithuania, USSR.

According to the age data of 4567 bream (Abramis brama (L.)) found in 45 lakes of east and southeast Lithuania bream of the same age grew differently in various ecological types of lakes. The broods grow slowly in thermally deep lakes and in lakes with the mean thermal depth and a narrow littoral. They grow better in eutrophic lakes with a wide littoral zone. The older bream grow quickly in lakes with abundant zoobenthos where chironomids dominate. One of the main reasons for this slow growth is irregular and light fishing, especially in lakes with developed spawning grounds for phytophilous fish. This leads to the very large populations of these fish. The bream are divided into 5 growth categories according to rate of growth: very good, above average, mean, slow and very slow. They mature sexually at 6-9 yr and are of very different sizes.--Copyright 1976, Biological Abstracts, Inc.
W76-10519

SOME DATA ON ZOOPLANKTON OF RESERVOIRS IN THE MARY AND CHARDZHOU REGIONS OF THE TURKMEN SSR, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W76-10520

A FIN ROT DISEASE OF MARINE AND EURYHALINE FISHES IN THE NEW YORK BIGHT,
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sport Fisheries Marine Lab.; and National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center.
J. B. Mahoney, F. H. Midlige, and D. G. Deuel.
Trans Am Fish Soc. 102(3), p 596-605, 1973.

Descriptors: *Fish diseases, Fish, New York, Marine fish, Pseudomonas, Epizootiology, Water pollution effects.
Identifiers: Aeromonas-Spp, Bluefish, *Euryhaline fish, Flounder, Rot, Vibrio-Spp, Weakfish, *Fin rot disease(Fish), *New York Bight.

A fin rot diseae reached epizootic proportions in 1967 among at least 22 species of marine and euryhaline fishes in the New York Bight and has continued to occur annually to the present time. Fin necrosis was the consistent external sign of the disease; other external pathological changes included skin hemorrhages, skin ulcers and, occasionally, blindness. Bluefish, summer flounder, winter flounder and weakfish were the principal species affected. Results of these studies indicate a bacterial cause. Bacteria of 3 genera, Aeromonas, Vibrio and Pseudomonas are likely implicated. Similar epizootics among freshwater fishes were associated with unsanitary conditions in aquaria and with water pollution in nature. The epizootic primary center, lower New York Harbor is grossly polluted with sewage and industrial wastes. Pollution may have a role in the disease.--Copyright 1974, Biological Abstracts, Inc.
W76-10524

REPORT OF KELLY'S FALLS POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 13, August 1974. 34 p. 1 fig., 4 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Eutrophication, Nutrients, Phosphorus, Nitrogen, Watersheds(Basins), Water quality, Basic data collections, Municipal wastes.
Identifiers: Kelly's Falls Pond(NH), Piscataquog River(NH), STORET 3305.

Kelly's Falls Pond is eutrophic as indicated by mean chlorophyll-a concentrations and low Secchi disc transparencies. Nutrient concentrations are indicative of a somewhat better trophic condition as its very short hydraulic retention time is suppressing the effect of very high nutrient loading rates. Phosphorus was limited at the time the assay sample was collected but nitrogen was limiting at the other sampling times. During the sampling year, the Pond received a total phosphorus load at a rate over six times greater than the rate proposed by Vollenweider as euthrophic. When a regional waste treatment plant facility becomes operational, the total phosphorus load to the Pond will only be reduced to about 200 lbs/acre/yr (still about five times greater than a eutrophic rate) because of non-point phosphorus sources. Even if the phosphorus export of the Piscataquog River at Kelly's Falls Pond had been a very low 30 lbs/sq mi/yr, the drainage area/pond area/ratio of 1,060/1 would have ensured a non-point source loading rate of more than 5 g/sq m/yr (i.e., in excess of a eutrophic rate). This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10525

REPORT ON POWDER MILL POND, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 14, August 1974. 44 p. 1 fig., 8 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Impoundments, Eutrophication, Water quality, Rooted aquatic plants, Nutrients, Phosphorus, Nitrogen, Municipal wastes, Watersheds(Basins), Basic data collections.
Identifiers: Mill Pond(NH), Contoocook River(NH), STORET 3302.

Powder Mill Pond is an impoundment of the Contoocook River near Bennington, New Hampshire. Survey data and other records show that it is eutrophic. Although algal blooms are rare, rooted aquatic vegetation is common to abundant in the shallower parts. Apparently, the short hydraulic retention time suppresses trophic responses to relatively high nutrient loading rates. At the time the algal assay sample was collected it was phosphorus limited; however, data obtained in June and August indicate it was nitrogen limited at those times. It received a total phosphorus load at a rate well in excess of that proposed by Vollenweider as a 'dangerous' eutrophic rate. It is estimated that the Town of Jaffrey contributed nearly 32% of the load, and the Town of Peterborough contributed about 20%. Whether the degree of improvement due to reduction in phosphorus loading would be commensurate with the costs of the high level of phosphorus removal required is questionable. The mean tributary nutrient exports were quite low during the sampling year. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmetal agencies with specific information fro basin planning and clean lakes. (Jones-Wisconsin)
W76-10526

REPORT ON GLEN LAKE, HILLSBOROUGH COUNTY, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 12, August 1974. 37 p. 1 fig., 5 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Eutrophication, Water quality, Nutrients, Phosphorus, Nitrogen, Municipal wastes, Watersheds(Basins), Basic data collections.
Identifiers: *Glen Lake(NH), Piscataquog River(NH), STORET 3306.

Glen Lake is a small eutrophic impoundment of the Piscataquog River at Goffstown. It exhibited hypolimnetic oxygen depletion, had moderately high mean nutrient concentrations, and only fair Secchi disc transparency during sampling. Algal assay results indicated it was phosphorus limited at time of collection. However, data show that at times it may be only narrowly phosphorus limited, or even nitrogen limited. It received an annual total phosphorus load more than three times that proposed by Vollenweider as 'dangerous'--a eutrophic rate. Goffstown contributed about 50%. A regional waste treatment plant at Manchester with an interceptor to Goffstown eliminating discharge to Glen Lake is proposed to reduce the total phosphorus load. The reduced rate will be somewhat in excess of a eutrophic rate but should result in a persistent phosphorus limitation and a significant reduction in algal blooms. The rather low phosphorus export of the Piscataquog River indicates that if there are point sources in the drainage basin, they are relatively minor. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10527

REPORT ON SEBASTICOOK LAKE, PENOBSCOT COUNTY, MAINE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 9, June 1974. 40 p. 1 fig., 18 ref.

Descriptors: *Lakes, *Maine, *Water pollution control, Eutrophication, Nitrogen, Watersheds(Basins), Water quality, Phosphorus, Basic data collections.
Identifiers: *Sebasticook Lake(Me), Sebasticook River(Me), STORET 2312.

The Sebasticook Lake watershed is primarily rolling hills, and the vegetation cover is mainly mixed soft- and hardwood forests. Uses are boating, domestic water supply, fishing, hunting, trapping, and swimming. Nuisance agal blooms have occurred periodically for many years and it is considered eutrophic. The algal assay results and lake data indicated Sebasticook Lake was nitrogen limited at the time the assay sample was collected and at other sampling periods. Surveys indicated the communities of Dexter and Corinna contributed about 70% of the total annual phosphorus load. If 80% removal of total phosphorus at these two point sources was instituted, the total annual phosphorus load would be reduced to 44% of its present level. This degree of reduction of the total phosphorus load would result in a persistent phosphorus limitation and would reduce or eliminate nuisance algal blooms. Of the total non-point source input, the greatest contribution is made by drainage from the East Branch of the Sebasticook River which inputs 15% of the annual phosphorus load and 32% of the annual nitrogen load. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10528

REPORT ON LAKE WINNEPESAUKEE, CARROLL AND BELKNAP COUNTIES, NEW HAMPSHIRE.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Working Paper No. 11, May 1974. 82 p. 1 fig., 7 ref.

Descriptors: *Lakes, *New Hampshire, *Water pollution control, Oligotrophy, Eutrophication, Water quality, Nutrients, Phosphorus, Nitrogen, Municipal wastes, Watersheds(Basins), Basic data collections.
Identifiers: *Lake Winnipesaukee(NH), STORET 3303.

At this time the main body of Lake Winnipesaukee is considered oligotrophic. Generally, water quality is excellent, but Wolfeboro Bay, Center Harbor Bay, Alton Bay, Gilford Bay, Melvin Bay, and Meredith Bay are areas with excessive nutrient loadings. Results of the algal assays show that Lake Winnipesaukee was phosphorus limited at the time the samples were collected. Approximately 45% of the total annual phosphorus input to the lake originates from point sources from four municipalities and 33% originates from tributaries and the lake's immediate drainage. No single tributary contributes a significant percentage of the load and land use controls would be of little value in further reducing the phosphorus input from non-point sources. Approximately 40% of the total nitrogen load originates from non-point sources in the watershed. The estimated nitrogen load in direct precipitation on the lake surface accounts for 40% of the total input. Removal of phosphorus from all waste treatment plant discharges to Lake Winnipesaukee would benefit the lake. This first evaluation stage of a series of selected lakes and their drainage basins is designed to provide state environmental agencies with specific information for basin planning and clean lakes. (Jones-Wisconsin)
W76-10529

WATER QUALITY IN A RECIRCULATING RACEWAY SYSTEM FOR FISH CULTURE,
Coastal Plain Experiment Station, Tifton, Ga. Dept. of Entomology and Fisheries.
For primary bibliographic entry see Field 5G.
W76-10546

PHYSICAL GROWTH AND BEHAVIORAL DEVELOPMENT OF MICE RECEIVING CHLORINE AND FLUORINE,
Connecticut Univ., Storrs.
R. A. Lewis.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 478 $4.50 in paper copy, $3.00 in microfiche. Master of Science Thesis, 1973. 54 p, 7 fig, 7 tab, 19 ref, 5 append. OWRT A-043-CONN(1).

Descriptors: *Chlorine, *Fluorine, *Behavior, *Growth rates, *Additives, Water supply, Water consumption, Animal growth, Laboratory animals, Mammals.
Identifiers: *Learning ability, Physical development, Behavioral evaluation, Mice, Measures of learning, Water maze.

The use of chlorine and fluorine is widespread in public water supply; chlorine as a water purifier and fluorine to reduce dental caries. To investigate the relationship between these water additives and the growth and behavioral development of organisms, two inbred strains of mice (C57BL/6J and A/J) were used as experimental animals. The superior learning ability of the C57BL/6J strain over the A/J strain was used to evaluate the effects of chlorine and fluorine upon a developing organism. The concentrations of the additives ranged from 2 ppm to 8 ppm and the development was examined from 25 days to 75 days of age of the mice. The dependent variables were weight and water consumption by the mice and learning ability measured in a water maze at 75 days of age. The results showed that chlorine and fluorine at 2-8 ppm produced no effects on growth, water consumption, or two of three measures of learning (latency and number of errors). (Katz)
W76-10551

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-10577

ANATOMY OF AN OIL SPILL,
For primary bibliographic entry see Field 5B.
W76-10597

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,
For primary bibliographic entry see Field 5B.
W76-10599

FLOW OF TOXIC METALS IN THE ENVIRONMENT,
Pan American Health Organization, Mexico City.
For primary bibliographic entry see Field 5B.
W76-10638

ENVIRONMENTAL LEVELS OF PCB'S,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5A.
W76-10641

POLYCHLORINATED BIPHENYLS OFF SOUTHERN CALIFORNIA,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, D. J. McDermott, and T. C. Heesen.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 4-1-1 - 4-1-5. 6 fig, 2 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Water pollution, *Water pollution effects, *California, *Coasts, Pollutant identification, Treatment facilities, Waste water treatment, Municipal wastes, Outlets, Marine animals, Monitoring, Bioindicators, Crabs, Mussels, Fish, Sediments, Harbors.
Identifiers: Chlorinated hydrocarbons, Bights, Flatfish.

Data on polychlorinated biphenyl contamination of the marine ecosystem off southern California are presented. Municipal waste water and aerial fallout dominate the known inputs of polychlorinated biphenyls to the southern California bight. More than 5 metric tons of 1242 and 1254 polychlorinated biphenyls were discharged during 1974 from the five major treatment plants in the area. Maximum concentrations of biphenyl found in bottom sediments off Palos Verdes Peninsula were 10 ppm, with values falling 100-fold to baseline readings over a depth of 20 cm. Muscle tissue from benthic crabs and flatfish collected from discharge regions also exhibited 100-fold increases in 1254 polychlorinated biphenyl levels. Numerous harbors in the bight also show relatively high levels of polychlorinated biphenyl contamination. Intertidal bay mussels contained up to 20 times more 1254 bphenyl than corresponding specimens collected nearby along the open coast. An offshore biomonitoring system which utilizes the intertidal coastal mussel (M. californianus) has been developed. This mussel appears to offer good potential for indicating zones of greatest biological availability of synthetic pollutants released from submarine outfalls. (See also W76-10637) (Kreager-FIRL)
W76-10647

POLLUTIONAL EFFECTS OF SUSPENDED, SEDIMENTED AND ERODED PARTICULATE MATERIAL IN THE AQUEOUS ENVIRONMENT,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. H. Hahn, and R. Klute.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 14-5-1 - 14-5-10. 6 fig, 1 tab, 25 ref.

Descriptors: *Suspended solids, *Sediment transport, *Sediment distribution, *Water pollution effects, *Rivers, Model studies, Heavy metals, Toxicity, Photosynthesis, Sorption, Sedimentation, Erosion, Aggregates.

The adverse effects of suspended and sedimented particulate matter on aqueous environments are reviewed to illustrate the inadequacy of monitoring for dissolved pollutants only. Suspended particulates are capable of limiting light penetration through natural waters, thus restricting photosynthetic activity. Particulate matter is capable of indirectly affecting water quality through its ability to sorb toxic heavy metals such as cadmium. Processes responsible for the transport and distribution of particulate material include aggregation, sedimentation, erosion, and aggregate destruction; the relative effect of these processes on transport and distribution depends on hydrodynamic and physicochemical factors. A simple mass balance and a dynamic model of the transport and distribution of cadmium in the Neckar River are presented to show that significant amounts of cadmium are transported in forms other than the dissolved form. Cadmium removal is shown to occur as a result of its adsorption on aggregating and sedimenting material, while reactivation is shown to occur via erosion and desorption. (See also W76-10637) (Kreager-FIRL)
W76-10663

A STRATEGY FOR AQUATIC POLLUTANTS FATE AND TRANSPORT DETERMINATION,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5B.
W76-10665

NUTRIENT TRANSPORTS THROUGH LANCASTER SOUND IN RELATION TO THE ARCTIC OCEAN'S REACTIVE SILICATE BUDGET AND THE OUTFLOW OF BERING STRAIT WATERS.
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W76-10717

DREDGED MATERIAL DISPOSAL--EFFECTS AND ALTERNATIVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W76-10724

PCB'S IN THE ENVIRONMENT,
Natural Resources Defense Council, N. Y., New York.
A. K. Ahmed.
Environment, Vol. 18, No. 2, p. 6-11 (1976). 6 p, 2 photo, 1 dwg, 1 tab.

Descriptors: *Chemical wastes, *Polychlorinated biphenyls, *Toxins, *Lethal limit, *Bioindicators, Pollutant identification, Hydroelectric plant, Industrial wastes, Waste water treatment, Water quality, Pesticide toxicity, Fishkill, Human pathology, Animal diseases, Regulation, Federal jurisdiction, State jurisdiction, International law.
Identifiers: *FWPCA Amendments of 1972, Administrative regulations.

Polychlorinated biphenyls (PCBs) have been widely used industrial chemicals for nearly 45 years. Until recently, however, the buildup of PCBs in marine animals, aquatic birds, bottom sediment of water courses, and even poultry and dairy products was unknown. PCB residues have been found in Holland, Germany, Scotland and Baltic Sea areas as well as in the United States. Most residues are found in areas of high industrialization. PCBs are toxic and are suspected as the cause of severe skin and neurological disorder in human being known as 'yusho syndrome'. The substance also appeared to affect reproduction in some birds and animals. Governmental response to the problem has been poor. The Food and Drug Administration tolerance limitations are dangerously high while the Environmental Protection Agency has not yet promulgated effluent standards. Several states, however, have taken measures to control PCB pollution, and the International Organization for Economic Cooperation and Development has urged restrictions on PCB usage. (Comer-Florida)
W76-10739

TROPIC STATUS OF SELECTED NORTHERN NEW MEXICO LAKES,
New Mexico Univ., Albuquerque. Dept. of Biology.
G. V. Johnson, and L. L. Barton.

Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 715, $7.50 in paper copy, $3.00 in microfiche. OWRT A-053-NMEX(1). New Mexico Water Resources Research Institute, Las Cruces, Report No. 074, June 1976, 178 p, 38 fig., 65 tab.,12 ref, append.

Descriptors: *Eutrophication, *Lakes, *Limnology, *Water chemistry, *Primary productivity, *Aquatic microbiology, Aquatic algae, Aquatic productivity, Nutrients, Nitrogen, Phosphorus, Lake stages, Oligotrophy, Tropic level, Water quality, Rocky Mountain Region, *New Mexico, Sodium, Potassium, Magnesium, Alkalinity, Hydrogen ion concentration, Calcium, Anabaena.
Identifiers: Eagle Nest Lake, Fenton Lake, Hopewell Lake, Lagunitas Lakes, Shannon-Wiener Index, Transparency, Aphanizomenon, Elodea.

A characterization of the algae, the bacteria, and the chemical and limnological conditions in Fenton Lake, Hopewell Lake, the Lagunitas Lakes, and Eagle Nest Lake was conducted to determine the tropic status of these northern New Mexico Lakes. The investigation was initiated after algal blooms were reported regularly during the summer on these lakes which represent different physical and biological environments. Special attention was given to conditions preceding the algal blooms and to the biological and chemical characteristics of the bloom. The algal studies included primary productivity measurements, species identification, and species enumeration. An examination of the dissolved and suspended nutrients was used to determine the contribution of nitrogen and phosphorus to production of blooms. The contribution of bacteria to blooms was examined. The tropic status for each lake was assessed based on primary productivity, nutrient levels, and predominant phytoplankton genera. (Hain-New Mexico State)
W76-10808

STUDIES ON THE TOXICITY OF AMMONIA, NITRATE AND THEIR MIXTURES TO THE COMMON GUPPY,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
A. J. Rubin, and M. A. Elmaraghy.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 721, $4.50 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 490, June 1976. 47 p, 14 fig, 7 tab, 29 ref. OWRT A-033-OHIO(1).

Descriptors: *Toxicity, *Ammonia, *Nitrates, Fish, Bioassay, Kinetics, Water pollution effects, Fry, Lethal limit, Equations.
Identifiers: Common Guppies, Chick's Law, *Ammonia/nitrate ratio.

Common guppies were raised under controlled conditions. The toxicities of ammonia and potassium nitrate solutions to their fry were estimated by establishing the 24 and 96 hour median tolerance limits. Then the joint toxicity of the two were estimated at different NH3/NO3 ratios. The toxicities are additive. Evaluated also were the applicability of several disinfection laws to fish toxicity. These included the equations of Chick, Watson, Hom, and Chen and Selleck.
W76-10811

ABUNDANCE AND BIOMASS OF ZOOPLANKTON DURING THE SYNOPTIC INVESTIGATION OF THE SHALLOW INLETS TO THE SOUTH OF THE ZINGST PENINSULA (SOUTH BALTIC) DURING MAY/JUNE, 1972. (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
W. Schnese, and F. Fischer.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1115-1118, 1973.

Descriptors: *Biomass, *Zooplankton, Copepods, Europe, *Synoptic analysis, Estuaries, Shallow water, Sampling.
Identifiers: Abundance, Zingst, *Baltic Sea, East Germany.

During a synoptic investigation of the shallow inlets from May 29th-June 3rd, 1972, 123 zooplankton samples were taken and evaluated both qualitatively and quantitatively. The mean biomass fluctuated between 0.6-17.9 g fresh weight at the 4 stations in the eastern part of the chain of shallow inlets to the S of Darss-Zingst (Barthe estuary and the Barther Bodden (East Germany). Copepods accounted for 99% of the biomass of the zooplankton.--Copyright 1976, Biological Abstracts, Inc.
W76-10817

STUDIES FOR WILDLIFE ON ENERGY AREAS,
Utah State Div. of Wildlife Resources, Salt Lake City.
For primary bibliographic entry see Field 6G.
W76-10820

AQUATIC MACROINVERTEBRATE WATER QUALITY, AND FISH POPULATION CHARACTERIZATION OF THE WHITE RIVER, UINTAH COUNTY, UTAH,
Brigham Young University, Provo, Utah.
For primary bibliographic entry see Field 6G.
W76-10821

RAPTOR STUDY OF UTAH OIL SHALE AREA,
Utah University, Salt Lake City.
For primary bibliographic entry see Field 6G.
W76-10822

NONGAME MAMMAL INVENTORY OF THE UTAH OIL SHALE AREA,
Natural History State Museum, Vernal, Utah.
For primary bibliographic entry see Field 6G.
W76-10823

STUDIES ON THE LEAST CHUB (IOTICHTHYS PHLEGETHONTISCOPE) IN GEOTHERMAL ACTIVITIES AREA OF SNAKE AND TULE VALLEYS, UTAH,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6G.
W76-10824

MARINE MOLYSMOLOGY: THE PRIMARY PRODUCTION OF EXPERIMENTAL ECOSYSTEMS SET UP IN THE RANCE RIVER ESTUARY. EFFECT OF CRUDE OIL,
Marine Laboratory of General and Comparative Physiology, Paris, France.
J. C. LaCaze.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 777T, $3.50 in paper copy, $3.00 in microfiche. EPA Translation EPA-TR-86-75. November 1974. 8 p. Translated from Comptes Rendus Academie Sciences, Paris, Vol. 278, May 13, 1974.

Descriptors: Laboratory analysis, *Toxicity, *Bioassay, *Primary productivity, Oil, *Oil pollution, *Inhibition, Experimental streams, *Oil wastes, Ecosystems, Methodology, Water pollution effects, Organic compounds, Estuaries.
Identifiers: *Primary production inhibition, Kuwait crude oil, *River Rance(France), Marine molysmology.

When crude oil (Kuwait) was discharged into experimental ecosystems a sharp 50% decrease in primary production resulted the day after pollution; this began to lessen the following day (25%) and disappeared on the third day. The fourth day marked the onset of toxicity which gradually increased until primary production was almost totally inhibited one week after pollution. This inhibition phase lasted ten days. During the rest of the experimental period, the primary production of the polluted ecosystems was approximately half that of the control ecosystems. (Katz)
W76-10830

EFFECTS OF THREE EMULSIFYING AGENTS AGAINST CRUDE OIL ON THE PRIMARY PRODUCTIVITY OF AN EXPERIMENTAL COMMUNITY OF BENTHIC DIATOMS,
Laboratoire de Physiologie des Etres Marins de l'Institut Oceanographique, Paris, France.
J. C. Lacaze.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 812-T, $3.50 in paper copy, $3.00 in microfiche. EPA Translation EPA-TR-S6-75. 1974. 17 p Translated from Vie Milieu, Vol. 23, part 1, Series B, 1972-1973.

Descriptors: *Bioassay, *Toxicity, *Primary productivity, *Diatoms, *Benthos, *Emulsifiers, Aquatic productivity, *Benthic flora, Oil, Aquatic algae, Laboratory tests, Phytoplankton, Aquatic environment, Water pollution effects, Taxonomy, Emulsions, Pollutant identification.
Identifiers: Taxonomic composition, *Benthic diatoms, *Gamasol, Anti-oil nonylphenols, Corexit 7664.

Study was made of modifications in the taxonomic composition and the primary production of a micro-community of benthic diatoms following acute pollution by various anti-oil emulsifying agents. This micro-community is settled on supports of polished glass, immersed in a brackish ecosystem in the laboratory. One of the reagents, the Gamasol, used extensively at the time of the shipwreck of the 'Torrey-Canyon' is shown to be particularly dangerous since a 30 minutes-exposure to a concentration of 40 mg/l completely destroys the community. (Katz)
W76-10831

FOAM SEPARATION FOR DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W76-10855

DETERMINATION OF THE BIOMASS AND DETRITUS CONTENT FROM NATURAL PHYTOPLANKTON SCOOP SAMPLES, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W76-10864

BENTHOGENIC PHYTODETRITUS IN EUTROPHIC COASTAL WATERS AS AN ENERGY SOURCE FOR SECONDARY PRODUCERS, (IN GERMAN),
Rostock Univ. (East Germany). Dept. of Biology.
H. D. Nagel, P. Spittler, J. A. Von Oertzen, and R. Kreutzmann.
Wiss Z Univ Rostock Math-Naturwiss Reihe 22(10), p 1129-1134, 1973.

Descriptors: *Algae, *Detritus, *Eutrophication, Coasts, Protozoa, Invertebrates, Growth rates, Energy, *Chara, Phytoplankton, Food chains.
Identifiers: *Characeae, *Enteromorpha.

Investigations regarding the food-biological valency of detritus obtained from Characeae and Enteromorpha in comparison with algae were carried out using protozoa and invertebrate cultures. The growth of the population was used as a criterion for the effectiveness of these foods. Feeding with detritus from Enteromorpha was more effective than feeding with algae for the majority of the species investigated. Chara detritus was usuable but

less effective.--Copyright 1976, Biological Abstracts, Inc.
W76-10866

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 850, $18.75 in paper copy, $3.00 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 76-202, July 1976, 790 p.

Descriptors: *DDT, *Bibliographies, Abstracts, Chlorinated hydrocarbon pesticides, DDD, DDE, Pesticides, Pesticide residues, Pesticide toxicity, Endrin, Dieldrin, Insecticides, Polychlorinated biphenyls, Pollutant identification, Toxicity, Path of pollutants, Water pollution.

This report, containing 486 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). The first volume (See W72-14431) was issued in October 1971 and covered the material announced in SWRA from October 1968 through October 1971. At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included.
W76-10877

RED CRAB (GERYON QUINQUEDENS) AND SNOW CRAB (CHIONOECETES OPILIO) RESISTANCE TO INFECTION BY THE LOBSTER PATHOGEN AEROCOCCUS VIRIDANS (VAR.) HOMARI,
Fisheries and Marine Service, Halifax (Nova Scotia). Dept. of Environment.
J. W. Cornick, and J. E. Stewart.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 5, 1975, p 702-706, 3 tab, 1 fig, 15 ref.

Descriptors: *Pathology, *Disease resistance, Pathogenic bacteria, Hosts, *Crabs, Lobsters, Temperature, Mortality.
Identifiers: Red crab, Snow crab.

Temperature tolerance data showed that red crabs can withstand water temperatures up to 14 degrees C without excessive mortality. Results of the pathogenicity studies indicated that while deaths occurred in both crab species, the numbers of microorganisms in the hemolymph were too low to have caused death. Reisolation from both crab species and inoculation into a group of 10 lobsters resulted in death to the lobsters. The mean time to death of 12 days indicated no loss of virulence while the microorganisms were in the crabs. It was concluded that the lobster pathogen is capable of existing in crabs and possibly other marine species in a viable state for extended periods of time. (Chilton-ORNL)
W76-10882

BEHAVIOURAL THERMOREGULATION AND ACTIVITY PATTERNS IN THE GREEN SUNFISH, LEPOMIS CYANELLUS,
Wisconsin Univ., Madison. Dept. of Zoology; and Wisconsin Univ., Madison. Lab. of Limnology.
T. L. Beitenger, J. J. Magnuson, W. H. Neill, and W. R. Shaffer.
Animal Behaviour, Vol. 23, 1975, p 222-229, 4 fig, 1 tab, 28 ref.

Descriptors: *Environmental effects, *Temperature, *Sunfishes, Diel migration, Thermal stress, Fish behavior.
Identifiers: Thermoregulation, Lepomis cyanellus.

In addition to examining thermoregulatory behaviour and diel locomotory activity patterns of individual green sunfish, a particular effort was made to identify possible diel changes in preferred temperatures and in the relationship between locomotory activity and temperature regulation in the experimental apparatus. Active avoidance of temperatures outside the range of 26.5 to 30.3 degrees C with a median preferred temperature of 28.2 degrees C were observed. Temperature preferenda did not differ significantly between day and night but more variation occurred at night. A crepuscular locomotory activity pattern occurred. Changes in illumination levels at dawn and dusk stimulated changes in activity. (Chilton-ORNL)
W76-10883

THE ANOMALOUS INFLUENCE OF SALINITY ON TEMPERATURE TOLERANCES OF SUMMER AND WINTER POPULATION OF THE COPEPOD EURYTEMORA AFFINIS,
Maryland Univ. Baltimore County, Baltimore. Dept. of Biological Sciences.
B. P. Bradley.
Biological Bulletin, Vol. 148, February 1975, p 26-34, 5 tab, 12 ref.

Descriptors: *Environmental effects, *Salinity, *Temperature, Resistance, *Copepods, Aquatic populations, Laboratory tests, Osmosis, Water pollution effects.
Identifiers: *Eurytemora affinis.

Thermal tolerances of populations of Eurytemora affinis were measured at various salinities with and without acclimation. Using a shock-recovery assay method (temperature shocking at 34.5 degrees C, observing time to succomb (TS) and time to recover (TR) over a 30 minute period) produced repeatable and significant difference in tolerance between populations collected in March and August as well as between salinities. Average tolerances and differences between populations increased with salinity. The distinction between populations in thermal tolerance was greater when the animals were osmotically acclimated for 24 hours. (See also W75-11046)(Chilton-ORNL)
W76-10884

TEMPERATURES SELECTED AND AVOIDED BY FISH AT VARIOUS ACCLIMATION TEMPERATURES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. S. Cherry, K. L. Dickson, and J. Cairns, Jr.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 4, 1975, p 485-491, 2 fig, 2 tab, 12 ref.

Descriptors: *Environmental effects, *Thermal pollution, Fish, Temperature, Limiting factors, Thermal stress, Fish behavior, Water pollution effects.

Temperature responses of 13 species of fish acclimated at temperatures from 6-30 degrees C with 3 degree increments were studied. The level of thermal acclimation directly affected the range of selected temperature in that the difference between the acclimation temperature and the selected temperature increased in all species. Correlation coefficients of preference versus acclimation temperature were high for most species, allowing for a predictive ability at acclimation temperatures not tested within the 30-6 degree C range. The range between the upper and lower avoidance temperature provided information relative to natural distribution of fish populations. Eurythermal species with a relatively wide difference (9-21 degrees C) between upper and lower avoidance temperatures were flexible in adjusting to a wide range, including the maximum 8 degree C differential between heated discharge channels and unaffected areas. (Chilton-ORNL)
W76-10885

BACTERIAL GROWTH RATES AND TEMPERATURE OPTIMA IN A STREAM WITH A FLUCTUATING THERMAL REGIME.
Academy of Natural Sciences of Philadelphia, Avondale, Pa. Stroud Water Research Center; and Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
T. L. Bott.
Limnology and Oceanography, Vol. 20, No. 2, March 1975, p 191-197, 2 tab, 2 fig, 15 ref.

Descriptors: *Environmental effects, Aquatic animals, *Bacteria, *Growth rates, *Temperature, Streams, Adaptation, Population.

Periphytic bacterial growth rates were studied directly in a natural stream at different seasons of the year. The stream had wide seasonal temperature variation (0.1-23 degrees C annual range) and diurnal fluctuations of as much as 10 degrees C. Doubling times of unicellular and filamentous populations were found to be 42-51 hours at water temperatures of 0-5 degrees C, 8.4-10.8 hours at water temperatures of 11-16 degrees C, and 2.8-6.0 hours at water temperatures of 16.5 -21.0 degrees C. Populations were optimally adapted to temperatures 5-20 degrees C higher that the prevailing stream water temperature. (Chilton-ORNL)
W76-10886

LIFE HISTORY AND ECOLOGY OF MEGARCYS SIGNATA (PLECOPTERA: PERLODIDAE), MILL CREEK, WASATCH MOUNTAINS, UTAH,
Utah Univ., Salt Lake City. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W76-10887

ENVIRONMENTAL REGULATION OF THE ANNUAL REPRODUCTIVE SEASON OF STRONGYLOCENTROTUS PURPURATUS (STIMPSON),
California Univ., Los Angeles. Dept. of Biology.
R. C. Cochran, and F. Engelmann.
Biological Bulletin, Vol. 148, June, 1975, p 393-401, 1 fig, 5 tab, 14 ref.

Descriptors: *Environmental effects, *Environmental control, *Reproduction, *Temperature, Seasonal, Aquatic animals, Photoperiodism, Temperature, Oceans.
Identifiers: *Sea Urchins, Strongylocentrotus purpuratus.

The annual reproductive cycle of a subtidal population of S. purpuratus correlated with seasonal changes in ocean temperature: a rise above 17 degrees C in June coincides with cessation of gamete production and storage. Sea urchins maintained at 13 degrees C retained gametes nearly two months beyond the date when the field population had spawned out. When the field population was reproductively active, the spawning capability of a laboratory group was terminated by three weeks of warm water temperature(19 degrees C). Spawning capability was not affected by photoperiod. (Chilton-ORNL)
W76-10888

THE RESPIRATORY STRATEGIES OF TWO SPECIES OF FRESHWATER GASTROPODS (ANCYLUS FLUVIATILIS MULL AND PLANORBIS CONTORTUS LINN) IN RELATION TO TEMPERATURE, OXYGEN CONCENTRATION, BODY SIZE AND SEASON,
Glasgow Univ. (Scotland). Dept. of Zoology.
P. Calow.
Physiological Zoology, Vol. 48, No. 2, 1975, p 114-129, 11 fig, 5 tab, 34 ref.

Descriptors: *Environmental effects, *Temperature, *Gastropods, *Oxygen, Seasonal, Size, Respiration, Water pollution effects.
Identifiers: Ancylus fluviatilis.

Under conditions of temperature disturbance Ancylus fluviatilis and Planorbis contortus showed acclimatory responses in the respiratory rates. In A. fluviatilis the rates of conditioned to 4 or 18 degrees C and then transferred to 10 degrees C moved at a progressively reducing rate on to a target level. In P. contortus the rates of the high and low temperature cohorts initially overshot the target before moving on to it. These differences indicate that A. fluviatilis is adapted to low and rapidly fluctuating conditions while P. contortus is adapted to higher and gradually fluctuating temperature conditions. To a limited extent, both species were able to regulate their respiratory rates during reductions in oxygen concentrations. This response was more complete in P. contortus. In both species the relationship between respiratory rate and body weight expressed in terms of ash-free dry fraction was allometric with a power value of .67, implying a functional relationship between respiration and body surface area. Neither species showed diurnal differences in respiratory rate but both showed seasonal effect. (Chilton-ORNL)
W76-10889

SURVIVAL OF HUMAN PATHOGENS IN THE MARINE ENVIRONMENT,
Maryland Univ., College Park. Dept. of Microbiology.
R. R. Colwell, and F. M. Hetrick.
Annual Report for Office of Naval Research, Period June 1974-May 1975, 23 p, 13 fig. N-00014-67-A-0239-0035.

Descriptors: *Bacteriology, *Pathology, *Viruses, *Enteric bacteria, *Human diseases, Aquatic environment, Temperature, Salinity, Laboratory tests, On-site investigations, Estuarine environment, Water pollution effects.

It was apparent from the results of the virus studies that enteric viruses survive for relatively long periods of time in estuarine and marine salinities when the water temperature is 25 degrees C or lower. Of the three enteroviruses tested, Coxsackie B-5 virus has been the most stable one with ECHO-6 virus being intermediate and polio 1 the least stable virus. This was true both in controlled laboratory experiments and in situ and is probably indicative of the diversity in stability one would encounter if all of the human enteroviruses were studied. While the salinity of the water may have a minor effect on enterovirus stability, clearly the most important factor affecting virus viability was the temperature of the water. (Chilton-ORNL)
W76-10890

TECHNIQUES DE DETERMINATION RADIDE DES EFFETS DE SYNERGIE RADIONUCLEIDES - POLLUANTS, (TECHNIQUES FOR RAPID DETERMINATION OF EFFECTS OF SYNERGY BETWEEN RADIONUCLIDES AND POLLUTANTS),
Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 5A.
W76-10891

TRACE ELEMENT INTERACTIONS IN THE ESTUARINE ZONE OF THE ANASCO RIVER, PUERTO RICO,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
D. A. Wolfe, W. O. Forster, R. McClin, and F. G. Lowman.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. IAEA-SM-197/18. p 155-178, 6 fig, 7 tab, 25 ref.

Descriptors: *Environmental effects, Chemistry, *Radioactivity, Estuaries, *Puerto Rico, *Trace elements, Particle size, Salinity, Freshwater, Sea water, Sediments.
Identifiers: Anasco River estuary(PR).

Data are presented on trace elements in suspended particulate matter and sediments from the stratified estuarine zone of the lower river channel. Stable Fe, Mn, Al, Sc, and Co were analyzed by neutron activation in the sediment cores and in suspended particulate matter. The bulk of the particulate matter contains concentrations of Mn, Al, Fe, Sc, and Co similar to those found in fresh water samples. These concentrations are higher than those found in the marine sediments. Al, Sc, and Fe concentrations in finely divided suspended matter were inversely related to salinity. Co and Mn showed no consistent relationship to salinity. Mn, Al, Fe, Sc, and Co concentrations on 0.45 micron suspended fraction were higher during the wet season than dry due to a change toward larger mean particle size. Sb125 remained largely soluble in river water-seawater mixtures irrespective of salinity or concentration of particulate matter. Mn54, Fe59, Zn65 Ag110 and Eu 155 showed lower fractional solubilities at higher contents of suspended material and increased in solubility as salinity increased. River water-seawater mixtures suggested desorption of absorbed radioactivity from suspended particulate material as salinity increases to 8%, or the formation of particulate material at low salinities. (See also W76-09490) (Chilton-ORNL).
W76-10892

INCIDENCE DE LA CHARGE POLLUANTE DES EAUX SUR LE COMPORTEMENT DES RADIONUCLEIDES, (EFFECT OF THE POLLUTANT BURDEN OF WATER ON THE BEHAVIOUR OF RADIONUCLIDES),
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses (France).
P. Bovard, A. Grauby, A. Saas, and R. Schaeffer.
In: Combined Effects of Radioactive, Chemical and Thermal Releases to the Environment, Proceedings of a symposium held in Stockholm, June 2-5, 1975. LAEA-SM-197/14. p 179-190, 7 fig, 5 ref.

Descriptors: *Water pollution effects, *Radioisotopes, Chemistry, Chemical oxygen demand, Biochemical oxygen demand, Behavior, Hydrogen ion concentration.

One example of pollution effects on the transfer of radionuclides which is presented is the change in chemical equilibrium of iodine as a function of pH value. Other examples include variations in the mobility of several elements under the influence of COD and the means by which the mobility potential of some radionuclides evolves from the point of release up to the irrigation limit. Interactions between irrigation water and ground water are discussed. Types of factors capable of leading to synergistic effects are identified as physical factors such as pH and temperature, chemical factors such as saline burden and COD, micro-biological factors as BOD, and extrinsic factors such as water regime and utilization. (See also W76-09490) (Chilton-ORNL)
W76-10893

METABOLISM OF MERCURY COMPOUNDS IN MICROORGANISMS,
Maryland Univ., College Park.
R. R. Colwell, and J. D. Nelson, Jr.
Environmental Protection Agency, Report EPA-600/3-75-007, October, 1975, 84 p., 25 tab., 29 fig., 80 ref.

Descriptors: *Marine microorganisms, *Mercury, Metals, *Sediments, *Chesapeake Bay, Aquatic microorganisms, Marine bacteria, Physiology, Public health, Dissolved oxygen, Water temperature, Annual succession, Estuaries, *Metabolism, *Heavy metals, Estuarine environment, Water pollution effects.
Identifiers: Mercury-resistant bacteria, Mercury metabolizing bacteria, Bacterial physiology, Mercury metabolite, Mercury mobilization.

The physiology and ecology of mercury-resistant and mercury-metabolizing bacteria from Chesapeake Bay are described. From the results of a survey of elemental mercury production among a group of randomly selected, HgCl2-resistant bacteria and mixed natural microbial populations, it was established that the enumeration of mercury-resistant bacteria by plate counting is a valid index of potential Hg2+ metabolism in situ. The distribution of mercury-resistant bacteria was significantly different in water and sediment, from station to station, and seasonally; the proportion of Hg2+-resistant bacteria among the total, viable, heterotrophic bacterial population reached a reproducible maximum in spring and was positively correlated with water turbidity, dissolved oxygen concentration, and mercury concentration in the sediment. These findings suggest that bacteria may contribute substantially to the mobilization and transformation of mercury from existing deposits in the aquatic environment. (Katz)
W76-10894

CHRONIC TOXICITY OF LINDANE TO SELECTED AQUATIC INVERTEBRATES AND FISHES,
EG and G, Bionomics, Wareham, Mass.
K. J. Macek, K. S. Buxton, S. K. Derr, J. W. Dean, and S. Santer.
Environmental Protection Agency, Report EPA-600/3-76-046, May, 1976. 50 p, 19 tab., 40 ref.

Descriptors: *Toxicity, *Bioassays, *Pesticides, *Freshwater fish, Diptera, Laboratory animals, Laboratory methods, Invertebrates, Minnow, Brook trout, Daphnia, Crustaceans, Midges, Water pollution effects, Sunfishes, Pollutant identification.
Identifiers: *Lindane, Scud, Gammarus, Fathead minnow, Pimephales promelas, Maximum accepted toxicant concentrations, Application factors.

Water fleas (Daphnia magna), midge (Chironomus tentans), scud (Gammarus fasciatus), bluegill (Lepomis macrochirus), fathead minnow (Pimephales promelas) and brook trout (Salvelinus fontinalis) were chronically exposed to various concentrations of lindane in separate flowing water systems. Maximum acceptable toxicant concentrations (MATC) of lindane for the selected species in soft water were estimated using survival, growth, and reproduction as indicators of toxic effects. The MATC was estimated to be between 2.2 and 5.0 ppb/l for midges, between 11 and 19 ppb/l for the water flea, and between 4.3 and 8.6 ppb/l for the scud. For fishes the MATC was estimated between 9.1 and 12.5 ppb/l for bluegills, between 9.1 and 23.5 ppb/l for fathead minnows, and between 8.8 and 16.6 ppb/l for brook trout. The incipient median lethal concentration (LC50) for fishes and the 48-hour LC50 for invertebrates was estimated from acute exposures and used to calculate application factors (MATC/LC50). For aquatic invertebrates and lindane the estimated application factors were between 0.010 and 0.024 for midges, between 0.020 and 0.029 for water flea, and between 0.11 and 0.22 for scud. Application factors were between 0.30 and 0.42 for bluegill, 0.13 and 0.34 for fathead minnows, and 0.34 and 0.64 for brook trout. (Katz)
W76-10895

TOXICITY OF CHLORINATED POWER PLANT CONDENSER COOLING WATERS TO FISH,
Michigan Water Resources Commission, East Lansing; and Michigan Bureau of Water Management, East Lansing.
R. E. Basch, and J. G. Truchan.
Environmental Protection Agency, Report EPA-600/3-76-009, April, 1976, 105 p., 47 tab., 10 fig., 35 ref.

Descriptors: *Chlorination, Water Purification, *Bioassay, *Electric powerplants, *Thermal powerplants, Chlorine, Toxicity, Water quality,

Freshwater fish, Laboratory tests, On-the-site investigations, Aquatic animals, Brown trout, Minnows, Industrial effluents, Mortality, Water pollution effects, *Thermal pollution, *Cooling water, *Waste water treatment.
Identifiers: Condenser cooling water, Fathead minnows, Residual chlorine, Live cage studies.

Studies were conducted during 1972 at five Michigan power plants in which caged brown trout (Salmo trutta) and fathead minnows (Pimephales promelas) were held for 96 hr in the intake and condenser cooling water discharge channels. Also, caged fish were held in condenser cooling water dechlorinated with sodium thiosulfate at the same time that fish in the discharge channel were subjected to 30-min chlorination periods. Total residual chlorine levels as low as 0.05 mg/liter were lethal to brown trout below four of the five plants. Total residual chlorine concentrations lethal to 50 percent (ILC-50) of the caged brown trout at two plants averaged from 0.02 to 0.18 mg/liter during the chlorination periods. Fathead minnow deaths in all studies could not be attributed to the total residual chlorine. Residident fish were observed in distress at two plants during 1972. These behavioral symptoms were noted at maximum total residual chlorine concentrations ranging from 0.2 to 0.5 mg/liter. Studies were repeated in 1973 at one plant with brown trout and other salmonid species. No deaths of test fish occurred during these tests that could be attributed to chlorine concentrations. The inconsistent results may be related to interactions between chlorine, temperature, and dissolved oxygen saturation in the discharge channel. (Katz)
W76-10896

COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE,
Environmental Research Lab., Duluth, Minn.
J. W. Arthur, R. W. Andrew, V. R. Mattson, D. T. Olson, and G. E. Glass.
Environmental Protection Agency, Report EPA-600/3-75-012, November, 1975, 62 p., 18 tab., 4 fig., 29 ref.

Descriptors: *Chlorination, *Water purification, *Bioassay, *Toxicity, Chlorine, Sewage treatment, Water quality, Freshwater fishes, Minnows, Daphnia, Methodology, Amphipods, Aquatic animals, Ozone, Laboratory methods, *Sewage effluents, Waste water treatment, Water pollution effects, Pollutant identification.
Identifiers: Flow-through bioassays, Chlorine toxicity, Ozone toxicity, Residual chlorine, Residual ozone.

Flow-through laboratory bioassays were conducted with a domestic secondary sewage effluent that had been disinfected by chlorination, by chlorination followed by dechlorination, and by ozonation. Short-term (7-day) exposures were conducted with 13 species (seven fish and six invertebrates), and long-term (generation) tests were performed with three species (one fish and two invertebrates). In both series of tests the chlorinated effluent was lethal at appreciably lower concentrations than any of the other three effluent treatments. Fish were more sensitive than the invertebrates to the chlorinated effluent in 7-day tests. The respective 7-day TL50 values of total residual chlorine to fish and invertebrates ranged from 0.08 to 0.26 and 0.21 to >0.81 mg/1. Residual ozone rapidly decreased in the treated effluent and was not measurable in the test tanks. When special short-term test procedures and shorter retention times for the ozonated effluent were used, measured residual ozone was about as lethal to fathead minnows as residual chlorine. The highest mean total residual chlorine concentrations having no long-term adverse effect on fathead minnows, amphipods, and Daphnia were 14, 12, and 2-4 ug/1, respectively. No daphnids survived at approximately 10 ug/1, mean total residual chlorine, a concentration that corresponds to a chlorinated sewage concentration of about 2.5%. (Katz)
W76-10898

EFFECTS OF MIREX, METHOXYCHLOR AND MALATHION ON DEVELOPMENT OF CRABS,
Duke Univ., Beaufort, N. C.
C. G. Bookhout, and J. D. Costlow, Jr.
Environmental Protection Agency, Report EPA 600/3-76-007, March 1976. 86 p, 33 tab., 5 fig., 60 ref.

Descriptors: *Bioassay, *Toxicity, *Pesticides, *Crabs, *Reproduction, Crustacea, Organic pesticides, Lethal limit, Laboratory methods, Laboratory animals, *Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Water pollution effects, *Pollutant identification.
Identifiers: *Mirex, *Methoxychlor, *Malathion, Larval development, Callinectes sapidus, Rhithropanopus harrisii, Pesticide residues.

Laboratory experiments were conducted to determine the effects of mirex, methoxychlor and malathion on the larval development of Callinectes sapidus from the time of hatching until the first crab stage is reached. For comparison, similar investigations were made to ascertain the effects of methoxychlor and malathion on larval development of Rhithropanopeus harrisii. The effect of a range of concentrations of each insecticide on survival of larvae of C. sapidus and R. harrisii was determined, as well as concentrations which were sublethal and lethal. Zoeal and total development to the first crab stage of R. harrisii and C. sapidus was prolonged in relation to increased concentrations of methoxychlor and malathion. Other sublethal effects of methoxychlor and malathion included abnormal development of the pleopods of male R. harrisii and male C. sapidus early crab stages, and autotomy of the legs of R. harrisii megalopa and early crab stages. The developmental stages in with larvae are particularly sensitive vary in the two species and with the three insecticides. Mirex residues of C. sapidus larvae reared in different concentrations of mirex, and methoxychlor residues of R. harrisii and C. sapidus larvae reared in concentrations of methoxychlor were determined. (Katz)
W76-10899

ACUTE TOXICITY OF SELECTED TOXICANTS TO SIX SPECIES OF FISH,
Chemico Process Plants Co., El Monte, Calif. Envirogenics Systems.
R. D. Cardwell, D. G. Foreman, T. R. Payne, and D. J. Wilbur.
Environmental Protection Agency, Report EPA-600/3-76-008, March, 1976. 117 p, 52 tab., 6 fig., 80 ref.

Descriptors: *Bioassay, *Toxicity, Methodology, *Arsenic compounds, Beryllium, Lead, Freshwater fish, Water quality, Water pollution effects, Laboratory animals, Channel catfish, Brook trout, Minnow, Sunfishes, Sodium arsenite, Sodium compounds, Fish types, Water pollution effects, *Pollutant identification.
Identifiers: *Sodium pentachlorophenate, *Selenium dioxide, *Beryllium sulfate, *Lead chloride, Flagfish, Goldfish, Fathead minnow, Sodium cyanide.

The relationship between median lethal concentration and exposure time was determined for five chemicals and up to six species of freshwater fish in a flow-through system. The lowest median lethal concentrations found were 0.114 mg/1 for sodium cyanide, 0.118 mg/1 for sodium pentachlorophenate, 2.9 mg/1 for selenium dioxide, 18.0 mg/1 for sodium arsenite, 25.4 mg/1 for beryllium sulfate, and greater than 100 mg/1 for lead chloride. Toxicity curves relating median lethal concentration to exposure time were of three types. One curve, resembling a rectangular hyperbola, characterized the toxicity of sodium cyanide, while another curve, sigmoid in shape, characterized the toxicity of selenium dioxide. Both types of curves were observed in toxicity tests with sodium pentachlorophenate, sodium arsenite and beryllium sulfate. Linear toxicity curves were recorded for some fish species exposed to selenium dioxide, sodium arsenite and beryllium sulfate, but these were usually encountered when exposure times were less than 96 hr. (Katz)
W76-10900

USE OF A TROPHODYNAMIC CHAIN OF THE BENTHIC TYPE FOR THE STUDY OF TRANSFERS OF METALLIC POLLUTANTS, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, R. Bittel, F. Laumond, M. Barelli, and M. Gauthier.
Rev Int Oceanogr Med 39/40; p 117-152, 1975.

Descriptors: *Trophic level, Metals, Pollutants, *Benthos, *Food chains, Path of pollutants.
Identifiers: Marine animals, *Metallic pollution, Trophodynamic chains.

To assess the hazards of pollution presented by metallic pollutants discharged into marine environment, either for marine organisms or for consumers of marine products, the method of marine trophic chains reproduced in the laboratory was used. The in vitro study of concentration phenomena and the transfers of different metals at each level of a benthic trophic chain were carried out. Five metals were considered: Cu, Zn, Cr, Pb and Hg, in an ionic form or associated with organic compounds generally found in effluents.--Copyright 1976, Biological Abstracts, Inc.
W76-10944

BACTERIOPLANKTON AND ITS SIGNIFICANCE IN THE BIOPRODUCTIVITY OF THE RESERVOIRS, (IN RUSSIAN),
D. Z. Gak.
Nauka: Moscow, USSR. 1975, 253 p.

Descriptors: *Bacteria, Plankton, *Productivity, Reservoirs, *Zooplankton, Biomass.
Identifiers: Ukrainian-SSR, USSR, *Bacterioplankton.

Results of experimental studies on the bacterioplankton of Dneiper (ukranian SSR, USSR) reservoirs are presented and the literature on the microbiology of water reservoirs is reviewed. Data on the abundance size and biomass of the bacteria found in the river and its reservoirs is presented. Bacterial population dynamics, reproduction rate and rate of bacteria consumption by zooplankton are discussed. Materials and methods of investigations are described, especially methods for estimation of bacterial production. The Kiev, Kremenchug, Dneiprodzerzhinsky, Zaporozksky and Kakhovsky reservoirs are the sites investigated. The last 2 chapters covered bacterial production of reservoirs and the role of bacteria in bioproductivity of reservoirs. An English summary is provided.--Copyright 1976, Biological Abstracts, Inc.
W76-10969

A BIOLOGICAL STUDY ON THE POLLUTION OF THE SAI-GAWA RIVER AND ITS TRIBUTARIES, ISHIKAWA PREFECTURE, (IN JAPANESE),
Kanazawa Univ. (Japan). Biology Inst.
For primary bibliographic entry see Field 5B.
W76-10973

MARKED DIMINUTION OF DISSOLVED OXYGEN IN THE HYPOLIMNION OF LAKE BIWA IN AUGUST, 1973, (IN JAPANESE),
Nara Women's Univ. (Japan). Zoological Inst.
M. Tsuda, and I. Morishita.
Jpn J Limnol 36(1), p 31-32, 1975.

Descriptors: *Dissolved oxygen, Eutrophication, *Hypolimnion, Lakes, Water pollution effects, Asia.
Identifiers: *Japan(Lake Biwa).

Determinations of the vertical distribution of dissolved O2 (DO) were done in Lake Biwa (Japan) on Aug. 23rd, 1973. There was greatly diminished DO, as little as 4% saturation in the bottom water at a depth of 93m off the island of Chikubushima. There was probably a small depression on the bottom. At 2 other stations, 85m and 76m deep, respectively, O2 deficiency in the hypolimnion was also observed. The results may indicate progressive eutrophication in Lake Biwa, which has been considered oligotrophic.--Copyright 1976, Biological Abstracts, Inc.
W76-10976

THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOODCHAIN STUDIES,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 529, $10.50 in paper copy, $3.00 in microfiche. Report No. NSF-RA-E-74-038, July 15, 1974. 368 p. NSF-RANN GI-32140.

Descriptors: *Feasibility studies, *Aquiculture, *Sewage treatment, *Recycling, *Food chains, Tertiary treatment, Nutrient removal, Marine algae, Viruses, Cooling water, Growth rates, Heavy metals, Oysters, Clams, Molluscs, Water temperature, Shellfish, Fish, Lobsters, Marketing, Bioassay.
Identifiers: Sea food farming.

The efficiency and feasibility of a combined tertiary sewage treatment and marine aquaculture system was investigated keyed to the growth of a single-celled marine algae in a secondary sewage effluent-seawater mixture to remove nutrients by algal assimilation. The algae would be fed to molluscs, which would remove the algae from suspension. Dissolved mollusc wastes would be removed by the red seaweed, Chondrus crispus. Solid wastes produced by the shellfish would serve as a food for worms or other invertebrates, and in turn would be consumed by flounder or lobsters. Investigations detail the effect of temperature on algal growth, algal nutrient transformations, nutrient removal, growth rates, marketing problems of waste-food recycling systems, the use of cooling water, permissible levels of heavy metals, integrated and polyspecies aquaculture systems, food chain dynamics, virus survival, and uptake and elimination of chlorobiphenyls in oysters. This wastewater treatment system would be suitable in coastal communities whose sewage is primarily domestic wastes, which have secondary treatment facilities close to the sea, and which have about an acre of land/1000 inhabitants available. While oyster growth did not meet expectations, results of laboratory experiments and a pilot-scale system equalled or surpassed original projections of performance and reliability. (See also W76-10987 thru W76-11000; and W76-06441, W76-03566, W76-10889) (Auen-Wisconsin)
W76-10986

A KINETIC APPROACH TO THE EFFECT OF TEMPERATURE ON ALGAL GROWTH,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, and E. J. Carpenter.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 27-56. 4 fig., 1 tab., 44 ref. NSF GI-32140, GA-37993.

Descriptors: *Water temperature, *Algae, *Growth rates, *Model studies, Nutrients, Kinetics, Environmental effects, Competition, Equations, Diatoms, Chlorophyta.
Identifiers: Arrhenium equation, Monod model.

A model is developed which incorporates the combined effects of temperature and nutrient limitation on algal growth rate. The temperature function is described by the Arrhenius equation and the nutrient relationship with the Monod model. The Arrhenium equation was inserted into the Monod model to determine maximum growth rate, as described by the product of temperature and nutrient concentrations. There was insufficient data to test the validity of the complete model, but the Arrhenium equation's usefulness in describing the effect of temperature on the maximum phytoplankton growth rate was tested. Using data from the literature on continuous culture experiments with freshwater and marine algae, it was found that the Arrhenium model describes the relationship between maximum growth rate and temperature. Use of the model may be limited to laboratory studies, but its general concepts may be used in natural water situations to help understand the role of temperature in controlling algal growth and species diversity. Combined effects of temperature and limiting nutrient concentration are described for various situations to show how interactions of environmental factors can influence algal growth and species competition. Models must be carefully used; the complete applicability and restrictions of this model are not yet known. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10987

REMOVAL OF INORGANIC NITROGEN IN AN INTEGRATED FOOD CHAIN SYSTEM,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, J. H. Ryther, and C. E. Gifford.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 91-109. 5 fig., 10 ref. NSF GI-32140.

Descriptors: *Waste water treatment, *Nutrient removal, *Nitrogen compounds, *Food chains, *Aquiculture, Growth rates, Marine algae, Diatoms, Oysters, Worms, Aquatic plants, Successions, Temperature.
Identifiers: Seaweeds.

An outdoor process was developed consisting of growth systems for marine algae (diatoms), oysters, polychaete worms (Nereis virens and Capitella capitata), and seaweeds (Chondrum crispus and Ulva lactuca). About half the influent nitrogen was transformed to particulate nitrogen. When ammonia nitrogen/total nitrogen was high, ammonia was released to the atmosphere and pH rose. For maximum nitrogen removal, nitrification at treatment plants must be prevented. Under steady-state conditions, particulate nitrogen and carbon decreased linearly as dilution rates increased, and nitrogen removal decreased. Higher dilution rates and wastewater fractions decreased particulate nitrogen, reduced oyster production, and increased nitrogen load to the seaweed system. Seaweed system efficiency in removing nitrogen and need for seaweed instead of oysters would determine the design and operation of the algal system. Particulate carbon production and pH varied with light; nitrogen removal and particulate nitrogen production were independent of time of day. Algal succession varied from pennates to diatoms as temperatures increased. Nitrogen removal was similar in algal and seaweed systems. U. lactuca has a reproductive stage so is unstable compared to C. crispus. C. crispus contains carrageenin. This process could solve wastewater pollution and protein shortage problems. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10988

RELATIVE GROWTH OF DIFFERENT SPECIES OF MARINE ALGAE IN WASTEWATER-SEAWATER MIXTURES,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, and H. I. Stanley.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 110-145. 3 fig., 5 tab., 28 ref. NSF-RANN GI-32140.

Descriptors: *Growth rates, *Marine algae, *Waste water treatment, *Sea water, Diatoms, Dominant organisms, Aquiculture, Nutrient removal, Tertiary treatment, Shellfish, Carbon, Nitrogen, Nitrates, Ammonia, Temperature, Competition, Waste dilution.
Identifiers: *Sea food farming, Skeletonema costatum, Monochrysis lutheri, Tetraselmis, Phaeodactylum tricornutum, Dunaliella tertiolecta, Thallassiosira pseudonana.

To understand diatom dominance in an outdoor mass cultivation system for marine algae which was part of a combined nutrient removal-marine aquaculture process for tertiary treatment of wastewater and production of commercially important shellfish, sixteen species of marine algae were grown in continuous monoculture under laboratory conditions simulating the outdoor experiments. Skeletonema costatum, Monochrysis lutheri, and Tetraselmis were never dominant in outdoor cultures but grew as well in monoculture as Phaeodactylum tricornutum, a diatom often dominant outdoors. When monocultures of Dunaliella tertiolecta and Thallassiosira pseudonana were contaminated with P. tricornutum, P. tricornutum, P. tricornutum rapidly became dominant. Probably a complex interaction of environmental factors is responsible for dominance of a particular species. Under conditions of almost complete nitrogen assimilation, the algal carbon/nitrogen ratio was high with nitrate-nitrogen and low with ammonium-nitrogen as the major nitrogen source. When algal growth was low so there was a large amount of inorganic nitrogen, the carbon/nitrogen ratio was low, ragardless of the nitrogen source. Algal species in large cultivation systems may be controlled by manipulating operating parameters (temperature, depth, dilution rate, mixing nutrient source, etc.) (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10989

HEAT EXCHANGERS FOR USE IN THE CULTURING OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass.
Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10990

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10991

THE USE OF POWER PLANT WASTE HEAT IN MARINE AQUACULTURE,
Woods Hole Oceanographic Institution, Mass.
Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-10992

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10993

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A

COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHODS, OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5D.
W76-10994

NEAR SURFACE SAMPLER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-10995

INTEGRATED SYSTEMS OF MOLLUSK CULTURE,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther, and K. R. Tenore.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 276-193. 10 ref.

Descriptors: *Aquiculture, *Mollusks, *Nutrient requirements, *Water temperature, Growth rates, Domestic wastes, Cooling water, Environmental effects, Sea water, Sewage effluents, Pilot plants, Powerplants, Dilution, Pollutants, Public health, Hazards, Economic feasibility, Technology.

Environmental factors necessary for mollusk growth are proper water temperature and availability of enough microscopic food organisms. Depending on the species and its value, a powerplant might produce enough warm water and food for a small, commercially viable shellfish industry. Intake water temperature could be increased 5-25C, depending on the cooling water system design. Usefullness of powerplant cooling water for molluscan culture depends on temperature of cooling and intake water, the thermal tolerances of the cultured species and control of toxic waste products in the cooling water. There may be legal constraints on marketing mollusks produced because of possible contamination. Powerplant shutdowns could be disastrous. Mollusks can withstand heat and cold shock. Thermal water pollution control constraints may interfere with beneficial use of cooling water. Lack of adequate food may be more disastrous in heated water; extremely eutrophic water, however, can become anoxic, abiotic, and inefficient with respect to food utilization by mollusks. Fertilization of water with nitrogen and phosphorus or use of nutrient-rich ocean water can be expensive. Domestic wastes could provide nourishment, but contamination by heavy metals, organic compounds, and human pathogens may occur. A pilot study using sewage effluents has been started. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10996

POLYSPECIES AQUACULTURE SYSTEMS: THE DETRITAL TRO'HIC LEVEL,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, M. G. Browne, and E. J. Chesney.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 294-309. 2 fig., 14 ref.

Descriptors: *Aquiculture, *Mollusks, *Productivity, *Benthic fauna, *Food chains, Energy transfer, Algae, Sewage effluents, Sea water, Annelids, Oysters, Standing crops, Digestion, Worms.
Identifiers: *Polyspecies aquiculture, Detrivores, Nereis virens, Biodeposits, Capitella capitata.

Food chain dynamics of a polyspecies aquaculture system were studied, using algal and invertebrate tanks. Species belonging to the detrital trophic level were produced with flowing, filtered seawater and controlled phytoplankton addition to tanks containing oysters. The average algal pond phytoplankton concentration was 21 mg carbon/l and the standing crop biomass was 48 g carbon. Each invertebrate tank received carbon from the algal culture and filtered sea water. Oysters received a daily food ration approximately 20% their biomass, removed 83% of available food, and their standing crop grew from 29.4-72.2 g carbon in 40 days, with an ecological efficiency of 9.8%. Oyster fecal biodeposits and pseudofeces supported a nereid polychaete (Nereis virens) or a mixed community of capitellid polychaete (Capitella capitata) and the amphipod (Corophium) on the tank bottom. The number of nereid worms decreased but the average weight increased threefold. The oyster tank seeded with caplitellids had a high macrofauna standing crop. The culture of these macrofauna on the biodeposits of oysters results in both increased efficiency of energy utilization and increases and diversifies the rearing of commercially important species. The worms are a valuable bait for sport fisheries, and the Capitella-Corophium can serve as a food source for species at the carnivore trophic level. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10997

COMPARISON OF THE FOOD CHAIN DYNAMICS OF THE POLYCHAETE, NEREIS VIRENS CULTURED ON ANIMAL TISSUE AND DETRITUS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, and U. K. Gopalan.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies, 'Report No. NSF-RA-E-038, July 15, 1974, p. 310-323. 2 tab., 13 ref. NSF GI-32140, GA-39911.

Descriptors: *Annelids, *Aquiculture, *Diets, *Detritus, Productivity, Growth rates, Oysters, Clams, Worms, Digestion, Marine animals, Benthic fauna.
Identifiers: Nereis virens, *Polyspecies aquiculture.

Knowledge of the nutritive value of detritus for facultative detrital feeders such as Nereis virens would help determine the importance of detritus in marine food chains. Growth rates of the clam worm, Nereis virens, grown on biodeposits of oysters and tissue of the clam, Mercenaria mercenaria, were compared. Worms grown on biodeposits ingested more than six times the weight of detritus compared to those fed clam tissue. The mean dry weight of worms fed biodeposits increased 48% in 42 days, compared to a 31% increase in worms cultured on clam tissue. Nereis produced about 0.01 g dry weight of mucous material per week per gram dry worm. Excluding mucous production, the ecological efficiency of worms fed on biodeposits was 5.7% compared to 18.0% for worms cultured on clam tissue; including mucous production, the values were 7.0 and 29.9%, respectively. The assimilation efficiency, including mucous production, was 28.8% for worms fed biodeposits and 77.3% for worms cultured on clam tissue. Biodeposits in both natural and aquaculture environments could be used as a food source for Nereis. This commercially valuable bait worm is a possible species for a polyculture system. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10998

VIRUS SURVIVAL PATTERNS IN A TERTIARY SEWAGE TREATMENT-AQUACULTURE MODEL SYSTEM,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-10999

UPTAKE, TRANSLOCATION AND ELIMINATION OF INDIVIDUAL CHLOROBIOPHENYLS BY OYSTERS,
Woods Hole Oceanographic Institution, Mass.
V. Vreeland.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 347-356. 7 ref. NSF-RANN GI-32140.

Descriptors: *Pesticide residues, *Aquiculture, *Oysters, *Polychlorinated biphenyls, Absorption, Translocation, Phytoplankton, Equilibrium, Chlorination, Analytical techniques, Sewage effluents.
Identifiers: Depuration.

Oysters were fed mixed phytoplankton plus chlorobiphenyls with 2 to 6 chlorine atoms/molecule in seawater. After a month, accumulations reached a plateau; accumulated amounts were directly proportional to amounts added to the water. More highly chlorinated chlorobiphenys accumulated in greater proportions. Factors such as heavy epiphytic growth reduced the concentration factor of more highly chlorinated chlorobiphenyls. Uptake patterns indicated that uptake was partitioned between oysters and water, with equilibrium depending on the number and arrangement of chlorine atoms on the chlorobiphenyl and on the nature of oyster lipids. There was no correlation between chlorobiphenyl concentration and oyster hexane-extractable lipid content. Oysters exposed to carbon-14-pentachlorobiphenyl in water for 5-6 hours showed individual variations depending on whether they pumped during uptake. More radioactivity was in gills, then viscera; after flushing, more radioactivity was in viscera and little in gills. Chlorobiphenyls with 5-6 chlorine atoms showed little depuration the first week. Chlorobiphenyls in food were localized in intestinal epithelium and those in water concentrated in gills and ciliary tracts. After flushing, labelling was also found in heart, circulatory system, and phagocyte cytoplasm. The results can be used to interpret chlorobiphenyl levels in oysters in an experimental food chain where they are fed phytoplankton grown on sewage effluents. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-11000

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME II.
National Academy of Sciences, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va 22161, as AD-783 990, $12.50 in paper copy, $3.00 in microfiche. May 1973. p. 375-824.

Descriptors: *Oil spills, *Oily waters, *Water pollution effects, *Marine environment, Analytical techniques, Chemical analysis, Statistical analysis, Weathering, Dispersion, Biodegradation, Marine organisms, Beaches, Public health.

Contributions are presented from experts working to quantify the effects of petroleum on the marine environment. Different analytical techniques both chemical and biological are described and the reliability criteria for these techniques are presented. The fate of petroleum in the ocean as affected by such processes as weathering, dispersement, biodegradation and biological uptake is described. The effects of catastrophic spills on coast lines, coastal biota, marine resources and human health are presented. (See W76-11008 thru W76-11031) (Katz)
W76-11007

THE OCCURANCE AND AMOUNT OF PELAGIC TAR IN THE OPEN OCEAN,
For primary bibliographic entry see Field 5B.
W76-11008

PELAGIC TAR IN THE NORTH PACIFIC OCEAN,
For primary bibliographic entry see Field 5A.
W76-11009

SOME MECHANISMS OF WEATHERING OF PETROLEUM HYDROCARBONS ON MARINE WATERS: COMPETITIVE PATHWAYS TO FATE AND DISPOSITION OF PETROLEUM POLLUTION,
For primary bibliographic entry see Field 5B.
W76-11010

THE SURFACE ACTIVITY OF PETROLEUM AND ITS INFLUENCE ON THE BEHAVIOR OF OIL AT SEA,
For primary bibliographic entry see Field 5B.
W76-11011

SEDIMENTATION PROCESSES INVOLVING HYDROCARBONS IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11012

BIOLOGICAL FATE OF PETROLEUM HYDROCARBONS IN AQUATIC MACROORGANISMS,
R. C. Clark.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 485-506, 47 ref.

Descriptors: *Marine environment, *Oil pollution, *Marine organisms, Lobsters, Crabs, Oysters, Mussels, *Toxicity, Animal physiology, Crustacea, Marine fisheries, Clams, Organic compounds.
Identifiers: *Barnacles, Hemigrapsus nudus, Mitella, Tetraclita, Mercenaria mercenaria, Mytilus.

Until the metabolic fate of the various classes of hydrocarbons present in petroleum, in the food web, and in the aquatic microorganism is examined, it will be impossible to evaluate the effects of persistent low-level petroleum pollution in the marine environment. The rates of uptake and turnover and the mechanisms of these processes must be determined experimentally. A discussion is presented of observations of petroleum hydrocarbon uptake by organism type. A detailed discussion of the characteristic differences between biogenic and petroleum hydrocarbons is also given. (See also W76-11007) (Katz)
W76-11014

MICROBIAL INTERACTION WITH OIL IN THE MARINE ENVIRONMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
G. D. Floodgate, D. F. Gibb, and K. P. Pugh.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 507-515, 5 ref.

Descriptors: *Oil pollution, *Marine environment, *Waste disposal, *Microbiology, *Nitrogen, *Phosphorous, *Light, *Marine fungi, *Photo-oxidation, Marine microorganisms, Waste water treatment, Water pollution, Weathering, Oil-water interface, Protozoan.
Identifiers: *Photooxidation, Rates of degradation, Calanus finmarchius.

The destruction of crude oil and its derivatives by microorganisms in the marine environment has been studied with two separate aims. These are: (1) The deliberate use of microorganisms as a means of removing spilt oil, by seeding the surface of the water with a high concentration of selected strongly hydrocarbonoclastic strains of bacteria. (2) To examine the rates and mode of action of natural populations of microorganisms on oil spilt at sea under vaious hydrographic and climatic conditions. While it appears that most factors which can change the chemistry of oil in the marine environment are known, there is a need to quantify the rates of change and assess their importance to the marine environment in general. (See also W76-11007) (Katz)
W76-11015

SOME REFLECTIONS ON THE BIODEGRADATION OF MINERAL OILS IN THE MARINE ENVIRONMENT,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5B.
W76-11016

FATES OF PETROLEUM IN THE SEA: BIOLOGICAL ASPECTS,
R. F. Lee, and A. A. Benson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 541-551, 24 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Fish, *Benthic organisms, Laboratory studies, Oil, *Oily water, Animal physiology, *Metabolism, *Biochemistry, *Mode of action, Laboratory animals, Mussel, Lobster.
Identifiers: *Uptake, Physical-chemical factors, Discharge, *Storage of hydrocarbons, Mytilus edulis.

Laboratory studies using selected species of phytoplankton, zooplankton, fish and benthic invertebrates have been used for uptake studies of dissolved hydrocarbons. Sea water suspensions and solutions of radioactive hydrocarbons were also used. (See also W76-11007) (Katz)
W76-11017

ACCUMULATION, RELEASE, AND RETENTION OF PETROLEUM HYDROCARBONS BY THE OYSTER, CRASSOSTREA VIRGINICA,
J. M. Teal, and J. J. Stegman.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 571-602, 3 tab., 5 fig., 20 ref.

Descriptors: *Oysters, *Oily water, *Oil spills, *Absorption, *Biological uptake, Water pollution, Penetration, Animal physiology, *Degradation, Molluscs, Analytical methods, Gas chromatography, Bioassay, Lipids.
Identifiers: *Lipid content, *Hydrocarbon accumulation, Hydrocarbon discharge, Non-biogenic hydrocarbons, Aliphatic hydrocarbons.

Two oyster populations differing in fat content were experimentally exposed to a complex petroleum hydrocarbon fraction. The hydrocarbons in this mixture were accumulated by both groups of oysters, and the lipid content of the animals as well as the concentration of hydrocarbon in the water were found to affect the rate and extent of accumulation. Hydrocarbons accumulated were rapidly, though incompletely, discharged when the oysters were transferred to an uncontaminated system. Amounts of hydrocarbons discharged and amounts retained after discharge are probably related to the level of contamination. The data can be interpreted as indicating that equilibration and the occurrence of multiple compartments where hydrocarbons can reside are major factors involved in the uptake and accumulation of nonbiogenic hydrocarbons. The petroleum hydrocarbons contained in the oysters differed from the contaminating oil by showing a greater aromatic content. In addition, gas-liquid chromatograms of aliphatic fractions of the hydrocarbons in the oysters rapidly showed a degraded appearance; the possibility that the oysters themselves are modifying the oil cannot be excluded. (See also W76-11007) (Katz)
W76-11018

BIOLOGICAL EFFECTS OF CHRONIC OIL POLLUTION ON COASTAL ECOSYSTEMS,
D. S. Boesch.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 603-618, 22 ref.

Descriptors: *Oil, *Oily water, *Oil pollution, *Marine environment, *Estuarine pollution, Water pollution effects, Toxicity, Bioassays, Primary production, Photosynthesis, Animal behavior, Food chains, Marshes, Salt marsh, Marsh plants.
Identifiers: Mangrove marshes, Sublethal effects.

Petrochemical waste receiving systems are characterized by extremely variable rates of photosynthesis and respiration due to local concentrations of highly toxic materials which depress metabolism on one hand and then stimulate metabolism by decomposed waste products on the other. It appears that petroleum hydrocarbons can be transferred via feeding but there is no convincing evidence for biological magnification as documented for chlorinated hydrocarbons. The biological effects of petroleum on estuaries and wetlands are discussed. (See also W76-11007) (Katz)
W76-11019

IMPACT OF CHRONIC AND ACUTE OIL POLLUTION ON SEA BIRDS,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
R. B. Clark.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 619-631, 5 tab., 45 ref.

Descriptors: *Oil, *Marine environment, *Oil pollution, *Birds, Oil-water interfaces, *Water birds, *Waterfowl, Wildlife, *Mortality, Water pollution effects, *Oil spills, Coasts.
Identifiers: *Jackass penguin, Chronic oil pollution, *Acute oil pollution, *Sea birds, *Mortality estimates, Population changes, Oil spill prevention, Oil spill treatment, *Treatment of oiled birds, *Seabird conservation, Beached bird surveys, British coast, Netherlands coast.

The only organisms damaged directly by oil pollution on a sufficient scale to affect the world, or generally even local populations are seabirds. Of these, only relatively few species are severely damaged. These birds are vulnerable to oil pollution because they spend much or almost all their lives on the water, they dive to collect their food, and they are weak fliers or are flightless (penguin). Losses of seabirds from oil pollution near coasts of countries (chiefly north-west Europe) where there has always been a strong amateur interest in birds have caused concern for more than 50 years following the conversion from coal to oil-fired ships and growth of the automobile industry since 1915-1920. (See also W76-11007) (Katz)
W76-11020

TOWARDS A MODEL OF THE EFFECTS OF OIL ON MARINE ORGANISMS,
S. F. Moore.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 635-654, 4 tab., 24 ref.

Descriptors: *Oil pollution, *Model studies, *Toxicity, Probabilities, Mathematical studies, Graphical analysis, Mathematical models, Physiology, Behavior, Absorption.
Identifiers: *Sublethal effects, Tainting, Acute toxicity, Coating of organisms, Habitat changes, Petroleum discharge impact, Oil composition, Behavioral changes.

The model approach is especially useful for two reasons: (1) gaps in understanding are more explicitly defined and therefore recommendations

for additional research are improved; and (2) a concise and systematic framework is available for challenging, questioning and reconciling various hypotheses regarding the effects of oil, leading to a better overall understanding of the problem. Such a model is summarized. (See also W76-11007) (Katz)
W76-11021

AN ANALYSIS OF THE MAIN SCIENTIFIC PAPERS DEALING WITH LONG TERM LOW LEVEL EFFECTS OF OIL POLLUTION,
C. P. Onuf.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 655-670, 5 fig., 20 ref.

Descriptors: *Oil pollution, Aquatic populations, *Fish populations, *Shrimp, *Marine fish, Oil, Oil pollution effects, Industrial effluents, On-the-site studies, Environmental effects, Productivity, Salt marsh, Laboratory studies, Toxicity.
Identifiers: *Refining wastes, *Natural oil seeps, *Sublethal effects, Coal Oil Point.

Demonstrable effects of long term pollution by oil are very local and often associated with concentrations that approach acutely toxic levels. Where more general effects have been suggested, confounding factors have not been satisfactorily discriminated. The fact that a long period of large scale oil extracting activities has not reduced the productivity of major fisheries along the Gulf Coast of Louisiana suggests that many populations in offshore regions can accommodate long term, low level intrusions of oil. The case for estuaries cannot be so succinctly stated nor dismissed. No respectable field experiments have been reported. (See also W76-11007) (Katz)
W76-11022

SOME CONSIDERATIONS OF THE CHRONIC EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT,
L. S. St. Amant.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 671-689, 2 tab., 44 ref.

Descriptors: Oil, *Oil pollution, *Water pollution effects, *Aquatic productivity, *Louisiana, *Gulf of Mexico, *Oil industry, *Oil wastes, *Toxicity, Productivity, Gulf Coastal Plain, Marine organisms, Oil spills, Marine environment, Estuarine pollution.
Identifiers: *Chronic toxicity, Chronic pollution, Taste and odor problems.

Any attempt to evaluate the chronic effect of petroleum pollution and/or production activities on the marine environment immediately leads into a morass of unknown factors, nonstandardized research procedures, less than satisfactory field observations and tests and widely varying and incomplete conclusions about the effects of oil on the marine ecosystem. This appears to be a result of difficulties in measuring the effects of low levels of oil on the marine system, the greater attention given infrequent short-term spectacular spills and the apparent ability of marine nursery areas to continue to produce high densities of marine organisms in spite of long-term chronic petroleum pollution. (See also W76-11007) (Katz)
W76-11023

UPTAKE AND DEPURATION OF SPECIFIC HYDROCARBONS FROM OIL BY THE BIVALVES RANGIA CUNEATA AND CRASSOSTREA VIRGINICA,
J. W. Anderson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 690-708, 7 tab., 1 fig.

Descriptors: *Oil, *Oil pollution, *Oil-water interfaces, *Clams, *Oysters, Animal physiology, Laboratory animals, Laboratory tests, Environmental effects, Degradation(Decomposition), *Metabolism, Physiological ecology, Gas chromatography, Infrared spectrophotometry.
Identifiers: Rangia cuneata, Crassostrea virginica, *Tissue hydrocarbon control, Oil-derived hydrocarbons, *Depuration, South Louisiana Crude Oil, *Number 2 Fuel Oil.

To test the assumption that petroleum hydrocarbons were retained in the tissues of molluscs for long periods, groups of clams, Rangia, and oysters, Crassostrea, were subjected to oil-water emulsions of four test-oils for long periods of time. The molluscs were analyzed for specific hydrocarbons. Findings indicated that the hydrocarbons are released from the tissues rapidly. (See also W76-11007) (Katz)
W76-11024

OIL IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11025

THE IMPORTANCE OF OIL POLLUTION IN THE NORTH SEA,
For primary bibliographic entry see Field 5B.
W76-11026

A LITERATURE REVIEW OF THE BIOLOGICAL IMPACT OF OIL SPILLS IN MARINE WATERS,
E. W. Mertens.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 744-757, 46 ref.

Descriptors: *Oil, *Oil pollution, *Marine environment, Reviews, Water pollution effects, Environmental effects, *Oil spills, *Bioassays, *Toxicity, Marine organisms.
Identifiers: *Major oil spills, *Torrey Canyon, *Oil dispersants, Literature reviews, Sublethal effect.

Selected literature regarding the biological impact of oil on the marine environment is reviewed. Emphasis is on the observed environmental effects of oil spills and bioassays to determine the toxicity of oils to marine organisms. (See also W76-11007) (Katz)
W76-11027

POSITION PAPER ON THE EFFECTS OF ACUTE OIL SPILLS,
W. J. North.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 758-777, 2 tab., 2 fig., 53 ref.

Descriptors: *Oil, *Oil spills, *Water pollution effects, *Toxicity, *Oily water, Marine flora, Benthic organisms, Intertidal areas, *Kelps, Marine organisms, Aquatic habitat, Reviews, Rooted aquatic plants.
Identifiers: West Falmouth Spill, Tampico Maru Spill, Subtle effects, *Giant kelp, Macrocystis, Sea Urchins.

Studies indicate that oil spills cause relatively limited disturbances that do not overtax recovery potentials of the ecosystem. However, since ecological change may require very long recovery periods, this factor alone would justify substantial effort and expense to prevent acute oil spills. (See also W76-11007) (Katz)
W76-11028

SOME BIOLOGICAL EFFECTS RELATED TO THE WEST FALMOUTH OIL SPILL,
H. L. Sanders.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 778-800, 6 fig, 12 ref.

Descriptors: *Oil, *Oily water, *Benthic organisms, *Environmental effects, *Oil spill, *Sediments, Toxicity, On-the-site observations, Benthic fauna, Marine animals, Littoral, Mortality, *Water pollution effects, Molluscs, Gastropods, Crustaceans.
Identifiers: No. 2 Fuel oil, West Falmouth(Mass), Subtidal benthos, Capitella capitata.

Observations on the biological effects of a spill of No. 2 fuel oil off West and North Falmouth have been made. After the spill emulsifiers were added to remove the oil. Detailed observations of the subtidal and intertidal fauna were made. (See also W76-11007) (Katz)
W76-11029

POLYNUCLEAR AROMATIC HYDROCARBON POLLUTION OF THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11030

IS OUR APPROACH TO THE OIL POLLUTION PROBLEM TOO CRUDE,
J. B. Sullivan.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Vol. II, May, 1973. p. 809-824, 5 tab, 1 fig, 24 ref.

Descriptors: *Oil, *Oil spills, *Marine environment, *Public health, Transportation, Water pollution effects, Toxicity, Oily water, Morbidity, Mortality, Water quality, Solubility, Ships.
Identifiers: *Carcinogens, *Toxic petroleum based compounds.

Crude oils contain substances that have carcinogenic properties. Many of the more toxic petroleum-based compounds are water soluble and readily enter the marine environment. A discussion is presented on the amount of carcinogenic material in product and in crude oil. (See also W76-11007) (Katz)
W76-11031

ZOOPLANKTON OF LAKES OF THE BOL'SHEZEMEL-SKAYA TUNDRA, (IN RUSSIAN),
Ministerstvo Selskogo Khozyaistva, Moscow (USSR).
N. V. Vekhov.
Zool Zh 54(2), p 181-187, 1975.

Descriptors: *Zooplankton, Lakes, *Rotifers, Biomass, Mesotrophy, Crustaceans, *Copepods, Eutrophication.
Identifiers: Bolshezemelskaya, *Conochilus-Unicornis, Tundra, USSR.

Lakes in the E Bolshezemelskyaya tundra (Russian SFSR, USSR), were studied. Small lakes are characterized by an almost complete absence of pelagic rotifers, except Conochilus unicornis. Plankton consists almost exclusively of copepods. In drainage lakes, channels and Yanei-Ty Lake, plankton is much richer. In drainage lakes and channels rotifers are less numerous than in Yanei-Ty lake. Rotifers or copepods predominate in population density, and cladocerans, more rarely copepods, in biomass. The ratio of biomass of predatory to non-predatory forms often exceeds 1; cladocerans predominate by biomass, the total biomass is high. The lakes can be considered mesotrophic according to the trophic classification for lakes of the middle belt.--Copyright 1976, Biological Abstracts, Inc.
W76-11056

TOXICITY OF AGRICULTURAL CHEMICALS TO LARVIVOROUS FISH IN KOREAN RICE FIELDS,
National Inst. of Health, Seoul (Republic of Korea).
J. C. Shim, and L. S. Self.
Trop Med. 15(3), p 123-130, 1973.

Descriptors: *Agricultural chemicals, Chemicals, Fish, Mosquitoes, Phenols, *Rice, *Toxicity, Asia, Herbicides, Water pollution effects.
Identifiers: *Korea, *Larvivorous fish, *Zaccoplatypus, *Aplocheilus latipes.

An important consideration regarding the maintenance or increase of fish populations in rice field areas in relation to Japanese encephalitis is whether the agricultural chemicals applied to rice fields are harmful to fish. The herbicide PCP (pentachlorophenol), which is commonly used in South Korea during the rice-transplanting period, is highly toxic to Aplocheilus latipes and Zacco platypus. Both species are larvivorous and offer promise in integrated (mosquito) vector control. Certain organophosphorus materials applied for rice pest control and the herbicide, 2,4-D were not toxic to fish populations.--Copyright 1974, Biological Abstracts, Inc.
W76-11095

DISTRIBUTION OF SUSPENDED OIL PARTICLES FOLLOWING THE GROUNDING OF THE TANKER ARROW,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W76-11096

OIL IN SEA ICE,
Department of the Environment, Victoria (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 5B.
W76-11098

IDENTIFICATION AND POTENTIAL BIOLOGICAL EFFECTS OF THE MAJOR COMPONENTS IN THE SEAWATER EXTRACT OF A BUNKER FUEL,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5A.
W76-11099

THE ROLE OF DISPERSION IN FUEL OIL BIOASSAY,
Battelle Pacific Northwest Lab., Richland, Wash. Marine Research Lab.
J. R. Vanderhorst, C. I. Gibson, and L. J. Moore.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 1, p 93-100, 1976. 1 fig, 4 tab, 12 ref.

Descriptors: *Bioassay, *Mortality, *Separation techniques, *Toxicity, *Fossil fuels, *Oil pollution, *Environmental effects, *Oil spills, Continental Shelf, Shrimp, Oil-water interfaces, *Dispersion, Water pollution effects.
Identifiers: *Outer Continental Shelf, Fuel oil, Depuration, Pandalus danae.

Mortality of coon stripe shrimp (Pandalus danae) has been investigated in flowing water aquarium systems receiving measured 'spills' of fuel oil with differing methods of seawater delivery and analytical characterization. The results obtained offer a data base for discussion of the influence of seawater delivery methods and dispersion on bioassay systems. The specific objective in the research was to measure aqueous phase concentrations of No. 2 fuel oil and mortality of shrimp when three different methods of oil-seawater contact were used. The studies clearly demonstrated that differing measured concentrations of fuel oil in the water column may be produced depending on the method of fuel oil-seawater contact. The dependence of water column concentration on the method of contact is so great that data presented in terms of oil-seawater ratios alone preclude meaningful discussion of toxicity. Mortality was produced in these studies at soluble aromatic concentrations an order of magnitude below concentrations in which similar shrimp survived in the earlier studies. Thus, the current findings emphasize the need to account for a wider range of compounds in the bioassay of petroleum. (Sinha-OEIS)
W76-11100

5D. Waste Treatment Processes

RECYCLING OF LIQUID DIGESTED SEWAGE SLUDGE ON DREDGED RIVER SAND,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
V. K. Chawla, J. Yip, and D. B. Cohen.
Technology Development Report EPS 4-WP-76-3, Environmental Protection Service, April, 1976, 44 p., 7 fig., 50 ref., 10 tab.

Descriptors: *Sewage sludge, Bacteria, Liquid wastes, Sludge, Rivers, Sand, Incineration, Land, Disposal, Landfills, Heavy metals, Nutrients, Dredging, Seepage, Infiltration, *Recycling, Water pollution, Waste disposal, *Sludge treatment, Sludge digestion.
Identifiers: Sea dumping, Liquid sludge.

An 18 month study to investigate the recycling of primary digested sewage sludge on sand was conducted at the Iona Island Sewage Treatment Plant in Vancouver, B. C. A four-plot site with a total areas of 0.4 hectares was used for the investigation. In October 1972, liquid primary digested sludge was applied once to plots 2, 3 and 4 at rates of 1435, 2635, and 5705 metric tons per hectare (1560, 2860 and 6190 kg TKN/ha), respectively. Plot 1 was used as a control. Total dry matter yields of grass harvested during the period April to December 1973 were 67, 1175, 1125 and 2170 kg/ha for plots 1, 2, 3 and 4, respectively. Total dry matter yield increased with sludge application rate. With the exception of iron, the concentration of chemical elements in plant tissues grown on sludged plots increased with sludge application rate, but no plant metal toxicity was observed. Leachate samples were collected over the study period and monitored for bacterial content as well as nutrient and metals. Very high mean leachate concentrations of TKN, NO3-N, NH3-N, occurred at the highest sludge application rates compared to the control. For plots 3 and 4, the maximum mean monthly values for ammonia and nitrate nitrogen were 81 and 195 mg NH3-N/l and 238 and 159 mg NO3-N/l, respectively. For the highest sludge application, the mean monthly metal concentrations in the leachate were within the maximum permissible limits for drinking or irrigation water (0.16 mg/l copper, 0.05 mg/l zinc, 0.03 mg/l lead, 0.32 mg/l nickel and 0.03 mg/l cadmium). The coliform count fell from 11 MPN/.01 ml to 2MPN/100ml in the first six months of application. (Environment Canada)
W76-10501

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
For primary bibliographic entry see Field 5G.
W76-10508

SAMPLING TECHNIQUES IN URBAN RUNOFF QUALITY STUDIES,
Canada Centre for Inland Waters, Burlington, Ontario, Hydraulic Div.
For primary bibliographic entry see Field 5A.
W76-10509

MUNICIPAL WASTEWATER TREATMENT WORKS, MODEL FACILITY PLAN FOR A SMALL, RURAL COMMUNITY.
Environmental Protection Agency, Washington, D. C. Office of Water Program Operations.
EPA Report MCD-08, September 1975, 36 p. 3 fig, 13 tab, append.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Rural areas, Alternative planning, Oxidation lagoons, Repairing, Retention, Waste water disposal, Land use.

The pollution problems in Brant, South Dakota, are typical of those facing many small communities. Brant has a population of about 475 and no industry. Its sewage treatment plant, including a lift station, Imhoff tank, trickling filter, final settling tank, and sludge drying beds, was constructed in 1950. These facilities need major repairs to become operable; currently untreated sewage is discharged to a confined area. It was determined that excessive infiltration and inflow do not exist. The present system is not meeting state and Federal regulations, and the discharge of untreated sewage causes public health hazards and odor problems. The treatment alternatives considered were remodeling the existing treatment plant, replacing it with a 3-cell stabilization pond system, retention of all sewage in lagoons with no discharge, installing a waste treatment package plant, and applying treated waste water to land by spray irrigation. On the basis of environmental effects, monetary costs, effluent requirements, operational considerations, and the probable effects on the environment, the stabilization pond system was recommended. (See also W76-05075) (Snyder-FIRL)
W76-10511

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS SYSTEM DESIGN,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
L. G. Rich, and S. C. White.
Water and Sewage Works, Vol. 123, No. 5, p 88-89, May, 1976. 2 fig, 4 ref.

Descriptors: *Waste water treatment, *Biochemical oxygen demand, *Treatment facilities, *Aerated lagoons, *Design, Effluents, Suspended solids, Suspension.
Identifiers: Retention time.

The total biochemical oxygen demand (BOD) in aerated lagoon effluent is the soluble BOD in the effluent plus 0.54 times the volatile suspended solids in the effluent. Assuming no algae in the effluent, about 20 mg/liter suspended solids is expected; therefore, the soluble BOD should be 20 mg/liter or less and probably 10 mg/liter or less to allow a margin for error. A partially suspended lagoon following a completely suspended lagoon requires less total volume than a single lagoon does to achieve the same soluble effluent BOD concentration, and an equation makes it possible to calculate the BOD in the first lagoon when the combined area is a minimum. Once this value has been computed, the required hydraulic retention times can be estimated for the lagoons. Total retention times were determined as a function of the soluble BOD in the effluent from the first lagoon for waste waters with different kinetic coefficients. The minimum hydraulic retention time in the first cell to prevent washout of all biomass solids can be calculated, and is equal to .60 d for most domestic waste waters. The minimum retention times for both solids removal and soluble BOD should control the system design. The hydraulic retention time in the partially suspended cell should not exceed 3 days, to prevent growth of algae. The possibility of sludge accumulation in this cell and its disposal should be considered in designing the system. (Snyder-FIRL)
W76-10512

FACTORS IN THE PURIFICATION OF FLOWING SEWAGE AND ACTIVATED SLUDGE PROCESS - PART 2,
Indian Inst. of Science. Bangalore. Dept. of Biochemistry.
S. C. Pillai, E. G. Srinath, C. V. Viswanathan, B. M. Bai, and G. K. Viswanath.
Water and Waste Treatment, Vol. 18, No. 10, p 42, 44, October, 1975. 1 fig, 42 ref.

Descriptors: *Sewage treatment, *Protozoa, *Aerobic treatment, *Activated sludge, *Municipal wastes, Waste water treatment, Pollutant identification, Biological treatment, Microorganisms, Evaluation.
Identifiers: Epistylis, Carchesium, Vorticellid protozoa.

Factors affecting the purification of flowing sewage discharged from Bangalore into two main natural channels on the outskirts of the city were compared with those affecting activated sludge processes. A common factor to both processes was the development of similar protozoa, particularly the Epistylis and Carchesium species of Vorticellid protozoa. The time necessary for the purification of sewage flowing in the channels ranged from about 4-6 hr which is comparable to that required for sewage purification via the activated sludge process. When samples of the sewage were agitated by a continuous air current for 24 hr and the supernatant liquids examined at hourly intervals during this period, there was no appreciable purification. However, when the Vorticellid protozoan Epistylis was grown on a glass tube which was used for aeration of the sewage, the supernatant liquid showed a degree of purification comparable to that caused by an activated sludge in a parallel set of experiments. The influence of the protozoa on sewage purification was further confirmed by the application of a fluidization technique. (See also W76-05795) (Kreager-FIRL)
W76-10513

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS VIII. SEPARATION BY MOLECULAR WEIGHTS ON SEPHADEX COLUMNS (ZBYTKOVE LATKY PO AKTIVACNIM PROCESU VIII. DELENI PODLE MOLEKULOVYCH HMOTNOSTI NA SEPHADEXECH),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5A.
W76-10514

RESIDUAL ORGANIC MATTER IN ACTIVATED SLUDGE PROCESS EFFLUENTS. IX. ISOLATION FROM WATER, FRACTIONATION ON ALUMINUM OXIDE COLUMNS AND ATTEMPTS OF IDENTIFICATION (ZBYTKOVE LATSY PO AKTIVACNIM PROCESU. IX. IZOLACE Z VODNEHO PROSTREDI, DELENI NA KYSLICNIKU HLINITEM A POKUSY O IDENTIFIKACI),
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Water Technology.
For primary bibliographic entry see Field 5A.
W76-10515

REGINA TERTIARY TREATMENT PLANT STUDY AND DESIGN, (PART II),
M. J. Stewart, and D. H. Lewis.
Water and Pollution Control, Vol. 114, No. 5, p 34, 36-40, May, 1976. 13 fig. 4 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Turbidity, *Phosphates, *Nutrient removal, Lime, Efficiencies, Tertiary treatment.
Identifiers: *Alum.

Test results showed that turbidity and phosphates decrease as alum dosage increases, but treatment effectiveness decreases rapidly for alum dosages beyond 150 to 200 mg/liter. It may be possible to achieved higher process efficiencies in summer, but the difference is not always pronounced. The only breakdown in process effectiveness found for lime treatment was with respect to turbidity. The greatest turbidity and phosphorus removals occurred during warm weather. The relative effectiveness of pilot plant operation with and without the settling tube module was compared. Although variability in influent characteristics caused a few aberrant results, the settling tube module was more effective than the conventional clarifier design. This research concentrated on clarification capacity, but it is equally important that the allowable solids loading rate on the bottom of the clarifier not be exceeded. The first stage of a possible future complete treatment plant was built, containing both lime and alum addition facilities operating on a split stream mode to produce a neutralized plant effluent prior to discharge. The plant can treat 20 Imgd from the stabilization ponds. Lime is delivered and stored in pebbled form; alum is transported in liquid form. The chemical clarifiers are interchangeable for either lime or alum feed. One storage basin for lime sludge and two for alum sludge are provided. Clarifier influents and effluents and the combined effluent mixing chamber are automatically sampled. (Snyder-FIRL)
W76-10516

ROUNDING UP RUNOFF: REFLECTIONS IN WASTE HANDLING SYSTEMS,
M. Lane.
Feedlot Management, Vol. 17, No. 12, p. 13-15, December, 1975. 3 fig.

Descriptors: *Feed lots, Planning, *Design, *Agricultural runoff, *Cost sharing, Waste treatment, Farm wastes, Agricultural runoff.
Identifiers: *Runoff control.

In order to participate in Soil Conservation Service programs, a feedlot owner must sign an agreement as a cooperator in the local soil conservation district or must be receiving Agricultural Stabilization and Conservation Service cost-sharing funds. Once one of these qualifications is met, expert planning assistance is at the feedlot owner's disposal through consultation with the SCS. SCS usually assists in small projects such as construction of farm ponds or terracing to prevent erosion, but it may also be called upon to assist in planning a whole feedlot design, giving guidance concerning runoff control measures. The design of all runoff control systems contains 3 basic elemets - a lagoon; a diversion around the feedlot to direct water falling inside the lot into the lagoon; and a clean water diversion, which keeps water running into the feedlot from becoming polluted. Instances of SCS assistance and planning are cited to illustrate how specific feedlot problems were overcome. Over the years, SCS has built up a knowledge of soils and drainage and altering water pathways. This places SCS in a better position than most to help control runoff from feedlots. (Merryman-East Central)
W76-10530

EPA'S NEW FEEDLOT DISPOSAL PLAN,
Calf News, Vol. 9, p. 49, 62, August, 1971.

Descriptors: *Feed lots, *Agricultural runoff, *Waste treatment, Phosphates, Nitrogen, Farm wastes, Filters, Biological treatment, Filtration, Waste disposal.
Identifiers: Biological filter, Retention ponds.

EPA's Robert S. Kerr Water Research Center in Ada, Oklahoma, is attempting to perfect a process wherein a colony of micro-organisms will purify the effluent from a 12,000-head feedlot on 8 to 10 acres of grassy slope. Using a 2-to-6 percent slope, with terraces, on soil too heavy to irrigate, the process removes better than 80% of the phosphate and about 95% of the nitrogen. A two-pond system is used with effluent being pumped from the second pond after 2 or 3 days retention. Start-up requires about six weeks to allow the colony to establish itself. The water supply must be nearly continuous. (East Central)
W76-10532

WATERWAY CLEANS FEEDLOT RUNOFF,
Beef, Vol. 11, No. 11, p. 2, July, 1975. 1 fig.

Descriptors: *Agricultural runoff, *Feed lots, *Nebraska, Farm wastes, Waterways, Waste disposal.
Identifiers: *Runoff control, Field sink, *Serpentive waterway.

Holding ponds are not entirely satisfactory for handling feedlot runoff. Odor, weed growth, and threat to safety are problems that often accompany their use. Some states do not consider feedlot runoff a water pollution hazard if the runoff flows a relatively long distance overland before reaching a stream. Consequently, USDA's Agricultural Research Service is evaluating two direct disposal systems on farms in Nebraska -- 'field sink' and a serpentine waterway. The 160 x 325-foot field sink with a 0.1% slope was installed between a feedlot and a creek. A one-foot dike was built around it. Feedlot runoff collects in a broad basin terrace and discharges to the field sink via a riser intake and underground pipe. The system functioned well with above normal precipitation in fall, 1973-June, 1974. Under conditions of severe drought, the sink produced 60 bushels of corn per acre, when much of the nearby crop was a failure. The serpentine or switchback waterway was established below a 3-acre feedlot near Gretna, Nebraska. The waterway zigzags with 8 sharp turns. In effect, the 2,600-foot waterway moves the feedlot back 2,200 feet from a stream that is about 400 feet from the edge of the feedlot. The waterway channel slopes to prevent ponding and is seeded in brome and alfalfa to retard flow. Runoff passes through debris basins before entering the channel. Only a major storm will cause an appreciable amount of effluent to enter the stream. (Merryman-East Central)
W76-10537

DISPOSAL OF CATTLE FEEDLOT WASTE IN AN ANAEROBIC LAGOON ON THE ORGANIC SOILS OF SOUTH FLORIDA--PRELIMINARY RESULTS,
Agricultural Research and Education Center Belle Glade, Fla.
For primary bibliographic entry see Field 5E.
W76-10540

WATER QUALITY AND MANAGEMENT CHARACTERISTICS OF FEEDLOT RUNOFF HOLDING PONDS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
E. C. Dickey, and D. H. Vanderholm.
Presented at the 1975 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 15-18, 1975, Paper No. 75-4568, 12 p. 6 fig, 3 tab, 8 ref.

Descriptors: *Water quality, *Feed lots, *Agricultural runoff, *Illinois, Rainfall-runoff relationships, Nitrogen, Phosphorus, Potassium, Farm wastes, Waste treatment, Water pollution sources.
Identifiers: *Holding ponds, Land application.

A study was initiated in 1974 to evaluate installed runoff control facilities in terms of their management requirements, operator acceptability, and their effectiveness in preventing water pollution. Six commercial livestock operations in central and northern Illinois--beef, dairy, and swine facilities--were monitored for two years. Findings directly related to characteristics and management of the holding ponds are presented. Each runoff control system consisted of a concrete settling basin with a gravity-drain or a pumped outlet, holding pond,

and pumping equipment for holding-pond dewatering. Rainfall and runoff data were collected at all locations. Five holding ponds were sampled monthly; the sixth was sampled weekly. The quality of holding-pond water is highly variable. Large variations in nitrogen, phosphorus, and potassium concentrations in the water were observed. Nitrogen concentration exhibited a definite seasonal trend: low concentrations during the summer months, increasing in late fall and winter, reaching a peak in late winter, and decreasing in the spring. Major factors affecting holding-pond water quality are the management of the lot surface, the number of animals in the system, and changes in annual rainfall patterns. In order to gain optimum nutrient benefits, dewatering of the holding pond should occur in the spring. However, dewatering in the fall is still recommended in most situations to provide capacity for winter runoff storage. (Cameron-East Central)
W76-10545

AN ECONOMIC APPRAISAL OF ALTERNATIVE DAIRY WASTE MANAGEMENT SYSTEMS DESIGNED FOR POLLUTION CONTROL,
Economic Research Service, East Lansing, Mich. Farm Production Economics Div.
J. B. Johnson, C. R. Hoglund, and B. Buxton.
Journal of Dairy Science, Vol. 56, p 1354-1366, October, 1973. 8 tab, 27 ref.

Descriptors: *Dairy industry, *Economics, *Agricultural runoff, Feed lots, Confinement pens, Liquid wastes, *Farm wastes, Pollution abatement, Water pollution control, *Alternative planning, Management.
Identifiers: *Waste management, Land spreading.

Enforcement of existing and proposed legal environmental controls will necessitate adjustments in manure handling practices on many dairy farms in the United States. The cost of these adjustments will depend on dairy herd size and type of production system currently in use. Stanchion or stanchion-switch systems generally would have an exercise lot and/or a feeding lot exposed to precipitation. Runoff can be controlled by diverting around lots uncontaminated waters from areas above the lots and directing lot runoff into a detention facility. Similar control facilities could be used for open-lot housing systems. Runoff from manure spreading operations can be reduced by applying manure to soils only twice a year. Each measure mentioned requires the addition of a storage facility. Open-lot systems which use a tractor scraper-loader-spreader system for daily manure spreading can add a storage facility or can convert to a tractor scraper-lagoon-aerator-irrigation system. Covered housing systems which currently use solid manure handling systems can usually add storage facilities to eliminate daily field spreading. Covered housing using liquid manure handling systems can add a mechanical scraper to the conventional tractor scraper-storage-loader-liquid-spreader. To eliminate field odor problems in liquid manure spreading, soil injector units can be added to liquid spreaders. Some of these adjustments will reduce costs, but most will increase costs and reduce net dairy income. (Cannon-East Central)
W76-10547

FINAL REPORT, MATERIAL EVALUATION AND DEVELOPMENT PROGRAM, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-10552

FINAL REPORT, HORIZONTAL SPRAY FILM (HTEX) AND VERTICAL TUBE (VTEX) EVAPORATOR, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-10553

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, METAL FINISHING INDUSTRY,
Lancy Labs., Zelienople, Pa.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-248 808, $16.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/24, October 1975. 609 p, 12 fig, 67 tab, 114 ref. WQ5AC007.

Descriptors: *Pollution abatement, *Estimated costs, Capital costs, Costs, Industrial wastes, Waste water treatment, *Treatment facilities, Industrial water, Metals, Operating costs, Maintenance costs, Federal Water Pollution Control Act, Water pollution control.
Identifiers: *Metal finishing industry, *Federal Water Pollution Control Act Amendments of 1972, National Commission on Water Quality, Water pollution abatement technology.

Pollution abatement technologies and costs are developed for the metal finishing industry, including job shops (SIC 3471) as well as captive operations that are part of other industry categories. Eight levels of abatement are studied including those promulgated or proposed by the U.S. Environmental Protection Agency under the Federal Water Pollution Control Act of 1972 (P.L. 92-500). Total estimated costs (in 1973 dollars) tc achieve the 1977 BPT level are $10.88 billion capital and $2.44 billion/yr O and M. Incremental added costs (also in 1973 dollars) to achieve the 1983 level are $10.84 billion capital and $1.7 billion/yr O and M. Also developed are residuals generated, and energy and other non-financial resource requirements. An estimated 70,000 facilities are identified under this industry category of which 4,000 are job shops. Over 70% discharge to publicly owned treatment works. (NCWQ)
W76-10555

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, IRON AND STEEL INDUSTRY,
MeKee (Arthur G.) and Co., Cleveland, Ohio.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-249 661, $16.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/25, November 1975. 621 p, 309 ref. WQ5AC005.

Descriptors: *Pollution abatement, *Waste water treatment, *Costs, *Industrial wastes, Capital costs, *Treatment facilities, Industrial water, Operating costs, Maintenance costs, Water pollution control, Federal Water Pollution Control Act, Iron, Steel.
Identifiers: *Iron and steel industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution control technology.

Pollution abatement technologies and their costs are examined for the iron and steel industry (SIC 3312, 3315, 3316 and 3317). Several levels of abatement are reviewed, including those promulgated or proposed by the U.S. Environmental Protection Agency under the Federal Water Pollution Control Act of 1972 (PL 92-500). Total estimated costs (in 1973 dollars) to achieve the 1977 BPT abatement level (best practicable control technology currently available) are $2.2 billion capital and $180 million/yr O and M. Incremental added costs (also in 1973 dollars) to achieve the 1983 abatement level (best available technology economically achievable) are $700 million capital and $40 million/yr O and M. Also developed are residuals generated, and energy other than non-financial resource requirements. Over 400 facilities are identified under this industrial category. (NCWQ)
W76-10558

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 806, $10.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/22, November 1975. 321 p, 5 fig, 12 tab. WQ5AC088.

Descriptors: Pollution abatement, Waste water treatment, *Farm wastes, Water pollution sources, Construction costs, Costs, *Sediment control, *Sediment yield, Soil conservation, Estimated costs, *Soil erosion, Federal Water Pollution Control Act, Residual soils, Runoff, Water pollution control.
Identifiers: *Nonpoint water pollution sources, Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

Pollution control technologies, their effectiveness and costs are examined for non-irrigated cropland, construction and silviculture. (1) Implementing selected soil conservation practices for 15 million acres deemed in need of treatment would cost an estimated $2 billion, annualized at $500 million or $3.10 per acre and would reduce sediment yield from 1,800 million to 922 million tons per year. (2) Annual cost of sediment control for construction is estimated at $1.44 billion, reducing sediment yield from 198 to 140 million tons. (3) Control measures, efficiencies and costs of sediment control for silviculture are more difficult to generalize. Where applicable, chopping can reduce sediment yield substantially. (NCWQ)
W76-10567

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10568

WATER POLLUTION CONTROL ACT OF 1972, SOCIAL IMPACTS, EIGHT CASE STUDIES.
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10569

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 1).
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10570

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 2),
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10571

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME I),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10572

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME II),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10573

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT, VOLUME I,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10574

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT VOLUME II,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10575

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-10577

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-10579

WATER QUALITY AND ECONOMIC CRITERIA FOR RURAL WASTEWATER AND WATER SUPPLY SYSTEMS,
Duke Univ., Durham, N. C. School of Forestry.
R. Rajagopal, R. L. Patterson, R. P. Canale, and J. M. Armstrong.
Journal Water Pollution Control Federation, Vol. 47, No. 7, p. 1834-1847, 1975. 5 fig., 4 tab., 17 ref. NOAA SG 04-3-158-23.

Descriptors: *Rural areas, *Water supply, *Sewerage, *Water distribution(Applied), *Groundwater, Urbanization, *Michigan, Equations, Septic tanks, Water wells, Costs, Economic efficiency, Water pollution, Waste water treatment, Waste water disposal.
Identifiers: Traverse City(Mich).

An analytical method is described to evaluate wastewater disposal and water supply alternatives on the basis of both economic and groundwater quality criteria for rural areas in transition of urbanization surrounding Grand Traverse Bay, Michigan. The assessment is based on the current state of groundwater quality, statistical correlations of water quality as related to land use, soil, well, and water table characteristics, population growth and distribution, cost analysis of alternative supply and disposal systems, and then synthesized in an interactive computer system. Residential density, cherry orchards acreage, and well and soil characteristics exhibited a statistical relationship with the groundwater concentration of nitrate-nitrogen. The prediction accuracy of the nonlinear statistical models for the three land uses decreased with the increase in orchards near the sample locations. The results indicate that for a set of existing groundwater flow and soil conditions, an optimal community size may be defined to meet water quality criteria at specific acquifer depths. The cost equations indicate that the construction of community wastewater disposal and water supply systems for rural areas in the 1000 to 5000 population ranges is uneconomical. But because of concentrated development in certain locations, some communities might seek uneconomic solutions to their sewerage and water supply problems because of water quality and public health criteria. (Auen-Wisconsin)
W76-10583

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10595

OXIDATION OF AMMONIA IN WATER BY FERRATES (VI) AND (IV),
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
K. Svanks.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 631, $5.00 in paper copy, $3.00 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 444, June 1976. 71 p, 18 fig, 9 tab, 26 ref. OWRT A-031-OHIO (1).

Descriptors: *Ammonia, *Oxidation, Sewage, Effluents, *Nitrogen, Nitrates, Nitrites, Phosphates, Chemical oxygen demand, *Waste water treatment, Iron, Sewage treatment, Reactions.
Identifiers: *Potassium ferrate(VI), *Ferrates(VI), Ferrates(IV).

The objective of the exploratory study was to determine the feasibility of application of ferrates (VI) to oxidation of ammonia to elemental nitrogen in pure water solutions and sewage treatment plant secondary effluent. Two competing reactions, the oxidation of ammonia and the decomposition of potassium ferrate (VI) proceed simultaneously. The net oxidation rate of ammonia, and the fraction of ammonia oxidized, depends on the relative rates of these two reactions. Generally, at pH values in the neutral and into alkaline region the reaction products are elemental nitrogen, nitrate, and nitrite, but with increasing pH the amount of nitrate and nitrite decreases. Depending on the imposed conditions, 30 to 80 percent of the oxidized ammonia was oxidized to elemental nitrogen. pH is the main factor affecting the stability of ferrate (VI) in water, and consequently also affects the extent of ammonia oxidation. A maximum of the fraction of ammonia oxidized was observed at pH 10.5 up to 11 and 15 percent was oxidized at mole ratios of ferrate (VI) to ammonia of 1:1 and 2:1 respectively and at ammonia concentrations of 15 ppm. In a sewage treatment plant secondary effluent, up to 25 percent of the ammonia was oxidized to elemental nitrogen by a two step procedure. A 30 percent C.O.D. reduction and 27 percent phosphate removal was also achieved.
W76-10611

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT: PARAMETER IDENTIFICATION,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W76-10613

FEASIBILITY STUDY OF A NUCLEAR POWER-SEWAGE TREATMENT SYSTEM FOR THE CONSERVATION AND RECLAMATION OF WATER RESOURCES,
Arizona Univ., Tucson. Dept. of Nuclear Engineering.
R. Fazzolare.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 630, $3.50 in paper copy, $3.00 in microfiche. Completion Report, (1976). 8 p, 1 fig, 1 tab, 3 ref. OWRT A-028-ARIZ(4). 14-31-0001-3503.

Descriptors: Water conservation, *Waste water treatment, *Sewage treatment, Reclaimed water, Activated carbon, Nuclear powerplants, Feasibility studies, *Water reuse, *Recycling, *Heated water, Heat treatment, Domestic wastes.
Identifiers: *Heated sewage.

Seventy percent of the energy produced in a nuclear power reactor is rejected to the environment as low quality heat. One possible use of this heat source is for domestic wastewater treatment. This study examined a ferric-chloride, powdered activated carbon and an aluminum sulfate, powdered activated carbon physical-chemical system in a one-step process as a function of temperature (20 - 80C). COD, suspended solids, turbidity and phosphorus removals were used to monitor performance. Significant improvement in pollutant removals was obtained at higher temperatures with the optimum results occurring between 50 and 60C. Since urban wastewater flow and electric power usage are population-dependent and the system optimum treatment temperature coincides with waste heat characteristics, a combined power plant-wastewater system would generate recyclable water.
W76-10614

DISPOSAL LAGOON.
Soil Conservation Service, Honolulu, Hawaii.
Engineering Standard, Miscellaneous Publication, Cooperative Extension Service, University of Hawaii, Volume 113, p 7-11, January, 1974.

Descriptors: *Design criteria, *Lagoons, *Waste disposal, *Hawaii, Aerobic conditions, Anaerobic conditions, Operation and maintenance, Biological treatment, *Waste treatment, Farm wastes, Effluents, *Water quality standards.
Identifiers: Effluent disposal.

A disposal lagoon is defined as an impoundment made by constructing an excavated pit, dam, embankment, dike, levee or combination of these for biological treatment of animal waste. This publication establishes, as an engineering standard for Hawaii, the minimum acceptable quality for design, construction, and maintenance of disposal lagoons located to serve predominantly rural or agricultural areas. (Merryman-East Central)
W76-10618

WATER TRANSPORT ACROSS CATION-EXCHANGE MEMBRANE. I. EXPERIMENTAL TECHNIQUE. INFLUENCE OF THE CONCENTRATION AND TEMPERATURE ON THE WATER TRANSPORT NUMBER,
Rouen Univ. (France). Lab. of Macromolecular Chemistry.
For primary bibliographic entry see Field 3A.
W76-10620

AN INTEGRATED POWER PROCESS MODEL OF WATER USE AND WASTEWATER TREATMENT IN CHLORINE CAUSTIC PRODUCTION,
Houston Univ., Tex.
F. D. Singleton, Jr., J. A. Galloway, and R. G. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 159, $5.00 in paper copy, $3.00 in microfiche. Report NSF-RA-E-74-048, 1975. 87 p, 20 fig, 17 tab, 20 ref, 2 append.

Descriptors: *Waste water treatment, *Model studies, *Water utilization, *Industrial production, *Chemical industry, Costs, Industrial water, Standards, Effluents, Water quality standards, Industrial wastes.
Identifiers: Chlorine caustic, Effluent standards.

A linear economic model of a representative chlorine-caustic plant was developed and used for evaluating the economic effects of increasingly restrictive waste water effluent standards and higher costs of water withdrawals on production costs, effluent taxes, water use, and solid waste discharges in chlorine-caustic production. Both mercury cell and diaphragm cell production methods were studied at the design stage. The model included production processes, energy system processes, water use and waste water treatment processes, and disposal processes for solid wastes and brine. The least-cost combination of processes was determined for each specification of waste water effluent standards and water withdrawal costs. Each combination of processes gives the quantity of each input purchased, the quantity of each pollutant discharged, and the cost of producing the required amount of chlorine caustic. Incremental cost estimates were made for increasingly restrictive waste water effluent standards for each pollutant. The marginal values implied by each combination were used to develop demand schedules for both the disposal and withdrawal uses of water. Zero discharges of total solids increased production costs 5.6% in diaphragm cell plants and 12.1% in mercury cell plants. Only diaphragm cells can accomplish zero discharge of mercury. (Snyder-FIRL)
W76-10621

AEROSOL PRODUCTION FROM LAND APPLICATION OF WASTEWATER BY AGRICULTURAL IRRIGATION EQUIPMENT,
Brookhaven National Lab., Upton, N. Y.
G. S. Raunor, and J. V. Hayes.
Available from the National Technical Information Service, Springfield, Va 22161, as BNL-19847, $3.50 in paper copy, $3.00 in microfiche. Report BNL 19847, (1975), 2 p. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, *Aerosols, *Application methods, Land use, Irrigation, Drops(Fluids), Spraying, Sprinkler irrigation.
Identifiers: Land application.

Dye particles resulting from evaporated spray droplets were sampled to study aerosol production from sprays of four agricultural nozzle systems. This investigation was part of a larger study evaluating upland recharge of waste water as an alternative to conventional sewage treatment and as a means to return water to underground aquifefrs after removal of nutrients by growing vegetation. Only a small percentage of the dye-containing water was aerosolized, but 10 to the 10th power or more particles were produced per min from single nozzles. Most droplets were smaller than 100 micron. The number of aerosol particles produced is related to wind speed and the length of time the liquid stream is exposed to the wind. Fewer aerosols are produced at low wind Speeds from low spraying nozzles, but concentrations may be higher because dilution by the airflow is less. Emitting fixed amounts of liquid may result in production of fewer aerosols at greater flow rates due to shorter operating time and shorter exposure to the wind. (Snyder-FIRL)
W76-10625

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
P. Somasundaran, and R. B. Grieves.
AIChE Symposium Series, Vol. 71, No. 150, 1975, 191 p.

Descriptors: *Interfaces, *Flotation, *Waste treatment, *Surfactants, *Adsorption, Chemical properties, Physical properties, Chemical reactions, Suspended solids, Metals, Ions, Sulfites, Desalination, Sulfides.

Advances in the area of interfacial phenomena of particulate/solution/gas systems are reviewed along with their application to flotation research. Topics covered include: basic principles of interfaces and solution phenomena; the role of metal ion hydrolysis and the roles of double layers and ion exchange properties of oxide and silicate mineral flotation systems; the application of flotation processes to the removal of precipitated metal ions from aqueous solution, calcium sulfite from scrubber liquor, surfactant additives and suspended solids from desalination solutions, and submicron particulates via high expansion foams; solid/solution/gas properties such as contact angle; solid/solution properties such as adsorption and electrokinetics; and solution/gas properties such as surface tension. The above properties are in most cases correlated with the flotation characteristics of minerals. The flotation chemistry of sulfide mineral systems is also discussed. (See W76-10628 thru W76-10636) (Kreager-FIRL)
W76-10627

INTERFACIAL CHEMISTRY OF PARTICULATE FLOTATION,
Henry Krumb School of Mines, New York.
For primary bibliographic entry see Field 5B.
W76-10628

ELECTROCHEMICAL PROPERTIES OF THE OXIDE-SOLUTION INTERFACE IN RELATION TO FLOTATION,
Department of Energy, Mines and Resources, Ottawa (Ontario). Mineral Sciences Div.
For primary bibliographic entry see Field 5B.
W76-10629

ION AND PRECIPITATE FLOTATION OF METAL IONS FROM SOLUTION,
Pennsylvania State Univ., University Park. Mineral Processing Section.
J. W. Perez, and F. F. Aplan.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 34-39, 1975. 3 fig, 3 tab, 25 ref.

Descriptors: *Water purification, *Flotation, *Copper, *Iron, *Ions, Efficiencies, Precipitation intensity, Surfactants, Chemical reactions, Evaluation, Performance, Sulfides, Metals.
Identifiers: Hydroxides, Precipitate flotation, Ion flotation.

The processes of ion and precipitate flotation were studied in connection with the removal of copper and iron ions from aqueous solutions. Precipitate flotation proved superior to ion flotation with respect to the amount of surfactant used. Roughly one mole of collector was required for every mole of metal ion removed during ion flotation, whereas only about 1/100 mole of surfactant was required for the removal of a mole of metal ion during precipitate flotation. Metal ion precipitation as sulfides showed the following advantages over precipitation as hydroxides: increased selectivity between species, reduced froth volumes, and the introduction of a broad variety of additional surfactants, especially sulfhydryl compounds which can be used as the collector. A mechanical laboratory flotation cell gave precipitate recoveries similar to those achieved with a foam column; the mechanical cell was also simpler to operate and showed greater potential for the control of foaming and thus froth volume. Breakup of precipitated aggregates was negligible with copper sulfide precipitates and modest for hydroxide precipitates. (See also W76-10627) (Kreager-FIRL)
W76-10630

PRECIPITATE FLOTATION OF CALCIUM SULFITE FROM DILUTE AQUEOUS SOLUTION WITH AN ANIONIC SURFACTANT,
Kentucky Univ., Lexington. Dept. of Chemical Engineering.
R. B. Grieves, D. Bhattacharyya, and W. T. Strange.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 40-45, 1975. 4 fig, 1 tab, 21 ref.

Descriptors: *Flotation, *Waste water treatment, *Industrial wastes, *Surfactants, *Sulfite liquors, Separation, Efficiencies, Feasibility studies, Performance, Evaluation, Chemical reactions, Treatment, Anions, Aqueous solutions.
Identifiers: *Precipitate flotation, Calcium sulfite.

Studies were conducted to assess the feasibility of using precipitate flotation for the treatment of waste streams from wet limestone scrubbing processes used to remove sulfur dioxide from power plant stack gases. The precipitation of calcium sulfite from dilute aqueous solutions (0.0025-0.0105 Molar) at a pH of 8.6 in the presence of calcium sulfate, followed by flotation with the strongly acidic and anionic surfactant sodium dodecylbenzenesulfonate at a feed to sulfite ratio of 0.011 mole/mole resulted in 85% removal of the total sulfite. An increase in the feed calcium to sulfite ratio from 1.0 to 2.0 did not affect the flotation as long as sufficient surfactant was present but did substantially improve the removal of total sulfite due to enhanced precipitation. (See also W76-10627) (Kreager-FIRL)
W76-10631

DETERMINATION OF SURFACE EQUILIBRIA AND MASS TRANSFER RATES IN A CONCURRENT FLOW BUBBLE COLUMN,
California Univ., Berkeley. Dept. of Chemical Engineering; and California Univ., Berkeley. Sea Water Conversion Lab.
E. Valdes-Krieg, C. J. King, and H. H. Sephton.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 46-51, 1975. 4 fig, 21 ref.

Descriptors: *Foam fractionation, *Waste water treatment, *Adsorption, *Surfactants, *Metals, *Solid wastes, Separation techniques, Flow, Equilibrium, Brines, Ions, Treatment, Equipment, Evaluation.
Identifiers: Bubble fractionation.

A technique for the measurement of surface equilibria in a concurrent-flow, gas-liquid bubble column was developed as part of a more extensive program dealing with the removal of surfactants, metal ions, and particulate matter from aqueous systems by combined foam and bubble fractionation. Test solutions consisted of either de-ionized water or model solutions simulating three-fold concentrated seawater brine. The concurrent flow method allowed for the determination of surface equilibria under both foaming and nonfoaming conditions. Mass transfer coefficients computed from concurrent flow experiments indicate that care must be exercised in the design of devices for adsorption equilibrium measurements to ensure enough bubble contact time with the liquid for equilibration to occur. The mass transfer rates ob-

served in the present experiment indicated that a satisfactory approach to equilibrium was obtained for a column of 174 cm in height. (See also W76-10627) (Kreager-FIRL)
W76-10632

BEHAVIOR OF HYDROGEN AND HYDROXYL IONS AT THE OXIDE-WATER INTERFACE,
Kyoto Univ., (Japan). Dept. of Mineral Science and Technology.
For primary bibliographic entry see Field 5B.
W76-10633

CHARACTERIZATION OF ADSORBED COBALT AT THE OXIDE-WATER INTERFACE,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
P. H. Tewari, and N. S. McIntyre.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 134-137, 1975. 5 fig, 1 tab, 7 ref.

Descriptors: *Adsorption, *Cobalt, *Flotation, *Waste treatment, *Interfaces, *Oxides, Chemical reactions, Metals, Ions, Water pollution control.
Identifiers: Aluminum oxide, Zirconium oxide, Oxide-water interfaces.

The adsorption of cobalt at the oxide-water interface was studied using aluminum oxide and zirconium oxide. The photoelectron line-binding energies for the adsorbed species were compared with those for a number of cobalt oxides and hydroxides to identify the cobalt species adsorbed onto the surface. For cobalt adsorbed from solutions at 30 C, the presence of electronic shake-up associated with the photoelectron lines indicated that the species was paramagnetic and was probably divalent cobalt. Adsorption of divalent cobalt on zirconium oxide and aluminum oxide increased with pH and temperature. Increasing surface coverage by adsorption produced surface precipitation of cobalt hydroxide under conditions that did not cause precipitation in the bulk solution. At higher temperatures the adsorbed cobalt reacted in the substrate to produce compounds like aluminates and spinels. Adsorption of metal ions from aqueous solutions is important to understanding processes involving mineral flotation and water pollution control. (See also W76-10627) (Kreager-FIRL)
W76-10634

CHARACTERIZATION OF SULFIDE MINERAL SURFACES IN FROTH FLOTATION SYSTEMS USING ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS,
Missouri Univ., Rolla. Dept. of Metallurgical and Nuclear Engineering.
R. K. Clifford, K. L. Purdy, and J. D. Miller.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 138-147, 1975. 6 fig, 4 tab, 44 ref.

Descriptors: *Analytical techniques, *Spectroscopy, *Froth flotation, *Waste treatment, *Sulfides, *Adsorption, Measurement, Feasibility studies, Evaluation, Surfaces, Pollutant identification, Chemical analysis.
Identifiers: Electron spectroscopy.

The feasibility of using electron spectroscopy for the characterization of 10 natural sulfide mineral surfaces in froth flotation systems was evaluated. Surface analyses on high quality speciments were made after comminution in air, comminution in a nitrogen atmosphere, adsorption of xanthate collector, and adsorption of dithiophosphate collector. Analyses were also made after modifiers such as disodium chromate, sulfur dioxide, starch, sodium cyanide, and copper sulfate and the collector had been adsorbed onto the surfaces of the sulfide minerals. Electron spectroscopy proved to be useful for following the action of modifiers rather than collectors due to the large amounts of sulfur and background carbon already present on the sulfide surfaces. The technique shows potential for yielding semiquantitative chemical analyses of the oxidation states of many elements on mineral surfaces. Normalization constants for semiquantitative analyses based on relative elemental sensitivity were calculated for each of the ten minerals studied. (See also W76-10627) (Kreager-FIRL)
W76-10635

ADSORPTION MECHANISM OF SULFIDES AT A PLATINUM-SOLUTION INTERFACE,
Karnataka Regional Engineering Coll., Suratkal (India).
K. A. Natarajan, and I. Iwasaki.
In: American Institute of Chemical Engineers Symposium Series, Vol. 71, No. 150, p 148-156, 1975. 9 fig, 1 tab, 26 ref.

Descriptors: *Electrodes, *Adsorption, *Sulfides, *Hydrogen sulfide, *Interfaces, *Electrochemistry, analytical techniques, Flotation, Waste water treatment, Sewage treatment, Monitoring.

The behavior of platinum electrodes in the presence of hydrogen sulfide and sulfide ions was studied to provide information on the effects of sulfides on electrochemical measurements used for process control in connection with water and sewage treatment systems as well as flotation processes. In acidic solutions, hydrogen sulfide was a severe poisoning agent, with electrode behavior becoming erratic in its presence. In neutral to alkaline solutions, the presence of sulfide ions in low concentrations did not seriously hamper the electrode response. The mechanism of sulfide adsorption at the platinum solution interface is discussed in relation to various types of potential measurements. (See also W76-10627) (Kreager-FIRL)
W76-10636

MONITORING: THE TRIGGER FOR ACTION,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5A.
W76-10640

AN EVALUATION OF AUTOMATIC WASTEWATER COMPOSITORS,
Environmental Protection Agency, Kansas City, Kans. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W76-10652

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
F. Simpson.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-7-1 - 9-7-4. 21 ref.

Descriptors: *Waste disposal, *Waste disposal wells, *Injection wells, *Monitoring, *Systems analysis, Wastewater treatment, Chemical reactions, Reservoirs, Aquifers, Equipment, Observation wells, Well data, *Canada.

A systems approach to subsurface waste disposal and monitoring is presented. A typical subsurface-disposal facility is broken down into the following three subsystems: an actuator (the disposal well) through which materials (fluid wastes) and energy (injection pressures and exothermic heat of chemical reactions) are directed into subsurface reservoirs; an injection-affected subsurface space of the disposal interval in which the growing plume of wastes is accommodated through structural adjustment of the aquifer framework and displacement of formation fluids; and a monitoring device which provides a continuous record of both waste behavior in the subsurface environment and the response of the reservoir strata to injection. Monitoring usually takes the form of one or more of the following: wellhead records of injection and annular fluid pressures; shallow and deep observation wells; and geodetic surveys to detect subsidence or increase in strain rate near fracture zones. The current status of monitoring in Canadian subsurface-disposal operations is reviewed with reference to 74 waste-injection facilities initiated to date. (See also W76-10637) (Kreager-FIRL)
W76-10662

SORPTION CAPABILITIES OF SOILS FOR PHOSPHATE REMOVAL,
Ontario Ministry of the Environment, Toronto. Applied Science Section.
G. D. Zarnett.
January, 1976, 56 p. Publication No. S58, 14 fig, 40 ref.

Descriptors: *Waste water treatment, *Sorption, *Soils, *Phosphates, *Efficiencies, Soil filters, Ion exchange, Adsorption, Nutrient removal, Septic tanks.

The efficiency of a septic tank tile field system depends heavily on the capability of the soil, which acts both as a filter and an ion exchange-adsorption medium, to remove potentially detrimental contaminants. Soil samples were analyzed to determine the amount of phosphorus already present and the amount of phosphorus that would rapidly be taken up by the soil. Phosphorus removal from effluents passing through soil took place by a combination of ion exchange, physical adsorption, and precipitation. Ion removal was related to the clays' structure and mineral content. Clays act by ion exchange and prefer the counter ion of higher valence. Selectivity increases with decreasing hydrated radius. Phosphate isotherms were determined by a 24 hr batch equilibration with a solution of a known phosphorus concentration. The degree of sorption by combined mechanisms was evaluated by an equilibrium-adsorption procedure. The Langmuir Isotherm Equation was used to correlate the equilibrium distribution between the soil and liquid phases. The Langmuir model can be readily extended to multi-species solutions. The rate of phosphorus movement in the soil was estimated using a form of the Langmuir Isotherm Equation, which also applies to the movement of other contaminants in groundwater flow. The life-time of the particular soil-groundwater system was then determined from the groundwater flow rate and the calculated ratio of water to contaminant velocity. (Snyder-FIRL)
W76-10673

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-10676

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10677

FLUID-MECHANICS ASPECTS IN THE DESIGN OF SEWAGE OUTFALLS INTO THE SEA (STROEMUNGSMECHANISCHE ENTWURFSASPEKTE FUER ABWASSEREINLEITUNGEN INS MEER),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 5E.
W76-10678

A FEASIBILITY STUDY OF THE CONTROL OF POLLUTION FROM INDUSTRIAL WASTE WATERS DISCHARGED INTO THE LAGOON OF VENICE,
Bostock, Hill and Rigby. Birmingham, (England).
R. K. Chalmers, and S. H. Jenkins.
Water Pollution Control, Vol. 75, No. 2, p 176-191, 1976. 4 fig, 7 tab, 5 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Feasibility studies, *Water pollution effects, *Lagoons, Treatment facilities, Sewage treatment, Evaluation, Chemical oxygen demand, Nitrogen, Ammonia, Sewers, Activated sludge, Costs, Effluents.
Identifiers: *Lagoon of Venice(Italy).

The feasibility of controlling industrial waste water discharged into the lagoon of Venice was investigated. Studies of the water quality in the lagoon and different canals throughout Venice revealed average nitrogen (as ammonia) concentrations ranging from 1.07 g/liter at Marittima to 6.49 g/liter at Fusina with corresponding chemical oxygen demand values of 32.71-34.31 mg/liter during the 1969-1970 period. Two technically feasible treatment alternatives were identified. One method involved making maximum use of the public sewer for industries preferring this disposal method and treating the remaining industrial effluent at one or more plants on the industrial site. The other alternative was to make maximum use of the public sewer and sewage treatment capacity, with the remaining portion of the industrial effluent being conveyed through a new and separate sewer to the sewage works for combined treatment with sewage. On the basis of costs for the treatment of similar chemical wastes using activated sludge and sludge incineration, the cost of treating the major part of the industrial effluent (about 75% of the load) on the industrial site appeared to be about the same of slightly greater than that for combined treatment at the sewage works. (Kreager-FIRL)
W76-10679

CITIES NEED SEWERLESS TOILETS,
Institute for Local Self-Reliance, Washington, D.C.
P. M. Nesbitt, and N. N. Seldman.
Building Systems Design, Vol. 73, No. 3, p 11-17, April/May, 1976. 10 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, *Treatment facilities, *Sewers, Sewage disposal, Costs, Biodegradation, Incineration.
Identifiers: *Sewerless toilets.

Compost toilets may have advantages in urban as well as rural areas. Alternatives to centralized physical-chemical waste water treatment technologies should be considered due to tough water quality standards and increasing costs of labor, energy, and chemicals. Upgrading and expansion of treatment plants are not expected to significantly improve overall river quality, because erosion and runoff problems are being ignored. Expansion and upgrading costs for treatment facilities are high, and operating costs are increasing. As sewage treatment improves, greater quantities of sludge are produced. The size of the waste load should be reduced. Sewer pipe should be repaired so that groundwater does not seep into the system, where it is treated unnecessarily. Sewerless toilets theoretically could eliminate the problems of large, centralized sewerage systems. One of these, the compost toilet degrades the wastes naturally to produce compost. Aerobic tanks are similar to septic tanks, but air is mixed into the tank, making them more reliable in areas where ordinary septic tanks have failed. Incineration toilets, which have been used effectively in remote areas, use large amounts of energy but could still be less expensive than centralized treatment. The closed loop oil-flush toilet is also available, which is flushed with a mineral oil from which the wastes are separated by gravity, so that the oil can be reused. (Snyder-FIRL)
W76-10680

HOW TO USE AND SELECT A SCREW PUMP,
Lakeside Equipment Corp. Bartlett, Ill.
For primary bibliographic entry see Field 8C.
W76-10681

FIBER-GLASS-REINFORCED POLYESTERS AND FURAN RESINS FOR WATER- AND WASTE-TREATMENT SYSTEMS,
Ashland Chemical Co., Columbus, Ohio. Resins and Plastics Div.
For primary bibliographic entry see Field 8G.
W76-10682

COMPARING INFLOW AND INFILTRATION,
Pool (Charles) and Associates, Inc., Ketchikan, Alaska.
J. J. Lutz.
Water and Sewage Works, Vol. 123, No. 5, p 68-69, May, 1976. 4 fig.

Descriptors: *Infiltration, *Inflow, *Sewers, *Hydrograph analysis, Analytical techniques, Hydrographs, Storm runoff, Computer programs, Cost-benefit analysis, Waste water treatment.
Identifiers: Infiltration/inflow.

Both inflow and infiltration into sewer systems vary considerably, and the problem of comparing systems can be avoided by standardizing field measurements to a common denominator to adjust all measured inflow and infiltration inputs to their probable peak values. This approach was used in Ketchikan, Alaska, where brief, intense inflow and infiltration episodes occur. Hydrograph analysis was performed, using a graphical technique similar to that used for stream hydrograph analysis. The first step involves subtracting the sanitary sewage component as determined from a dry weather base flow period. The graphical separation of infiltration is accomplished by estimating 'straight line' patterns on semilogarithmic graph paper as is done in determining stream baseflow levels in hydrology applications. After a number of storms have been analyzed, it is possible to estimate the probable worst infiltration rate and to relate inflow to rainfall. Inflow and infiltration problems are standardized by expressing every individual problem as a percentage of the whole at the time of measurement and multiplying the percentage by anticipated peak inflow or infiltration. If the percentages add up to more than 100%, the hydrograph analysis obviously bears checking. Individual percentages adding up to less than 100% of the total infiltration/inflow problem quantify the magnitude of undiscovered problems. A computer program has been developed to perform the standardization arithmetic once hydrographs have been manually analyzed. There is a degree of judgment involved when splitting the hydrograph into components, and users are cautioned to watch for seasonal variations. These techniques demonstrate that it is possible to adapt cost-effective analysis to the complexities of infiltration/inflow behavior. (Snyder-FIRL)
W76-10683

CLEVELAND MIXES METHODS IN SEWER CONSTRUCTION.
Water and Sewage Works, Vol. 123, No. 5, p 90-91, May, 1976. 2 fig.

Descriptors: *Interceptor sewers, *Tunnels, *Tunneling, *Excavation, *Sewers, *Tunneling machines, Soil types, Diversion structures, Storm water, Clays, Shales.

The Northwest Interceptor Sewer, one of five to be constructed in the Cleveland Regional Sewer District, is currently under construction and will divert stormflow in times of heavy rainfall. A combination of tunneling techniques are being used, because the sewer extends through several miles of mixed soil composition. A 4,200-ft-long open cut is also being used. For one section, an electrically powered machine with a 6 ft long blade cut the blue clay soil; then circular steel ribs were inserted. In areas where earth composition is shale, mining machines are being used. Various means are also being used to support the tunnels. Laser beam guidance systems have been used to keep the tunnel on line and grade. (Snyder-FIRL)
W76-10684

UNDERLAKE SEWER SPURS RESORT DEVELOPMENT,
Burns and McDonnell, Kansas City, Mo.
N. McDonald, and W. Goodnow.
Water and Wastes Engineering, Vol. 13, No. 5, p 70, 72, May, 1976. 1 fig.

Descriptors: *Sewers, *Waste water treatment, *Treatment facilities, *Interceptor sewers, *Sewerage, *Subsurface drainage, Sanitary engineering, Materials, Engineering structures, Conduits, Lakes, Missouri.

An interceptor and waste water treatment plant project for the 25-square-mile Middle Big Creek watershed located south of Lee's Summit, Missouri is described. Sub-aqueous interceptors extend through three lake areas and are designed to provide gravity sewer service to the lakes' frontal development and eliminate the need for expensive lift station and force main systems around lake perimeters. The interceptor construction is designed to provide sewer service to a projected ultimate population of 78,000. The sub-aqueous pipe through the lakes is either ductile iron or prestressed steel-cylinder concrete pipe with supplemental interior coatings for corrosion and erosion protection. The pipeline is buried beneath the lake and pressure tested at heads greater than the lake's flood pool elevations to insure that lake water does not leak into the sewer. A 2 million gallon/day treatment plant is also scheduled for construction and will include a 2000 gallon/minute lift station, two 10-foot-deep aeration basins totaling 13.26 surface acres, a chlorine contact chamber, a standby power generator, and a blower building containing all controls and aeration compressor equipment. The interceptor and treatment plant project is funded by a 75% Environmental Protection Agency grant, 15% state grant, and 10% local share. (Kreager-FIRL)
W76-10685

HYDRAULIC JUMP IN CIRCULAR SEWERS,
Greater Chicago Metropolitan Sanitary District, Ill. Sewer Design Section.
A. S. Paintal.
Water and Sewage Works, p R-216-R-217, April 30, 1976. 4 fig.

Descriptors: *Sewers, *Hydraulic jump, *Graphical methods, *Equations, *Graphical analysis, Fluid mechanics, Hydraulics, Flow, Flow rates, Waste water treatment, Sanitary engineering.

A graphical method for estimating hydraulic jump depths in circular sewers is presented. The method is developed by first writing an equation for applying the momentum principle to a hydraulic jump in a horizontal circular sewer. Equations are then developed which relate the pre-jump and post-jump depths to the flow rate and sewer size. A graphical representation of these equations is then used to estimate pre- or post-jump depth for a given flow depth and flow rate. (Kreager-FIRL)
W76-10686

TOWN MAINTAINS SEWERS DESPITE 'SUGAR SAND',
Bossier City Utilities Dept., La.
J. H. Venable.

Water and Wastes Engineering, Vol. 15, No. 3, p 45, 48, May, 1976.

Descriptors: *Sewers, *Quicksand, *Municipal wastes, *Repairing, *Maintenance, Equipment, Financing, Sanitary engineering, Geology, Polymers, Materials.
Identifiers: Sugar sand, Polyvinyl chloride.

Measures taken by Bossier City, Louisiana to maintain over 100 miles of sewer line which is particularly susceptible to breakage as a result of the fact that the city is located atop a subterranean layer of quicksand-like material called sugar sand are described. The loose consistency of sugar sand causes sewer line shifts, resulting in breakage. The exclusive installation of polyvinyl chloride pipe on both repair and new line construction was initiated to reduce problems associated with susceptibility to shock and soil corrosion. The city handles its own repair jobs internally and owns such equipment as a truck-mounted flexible high-velocity pipe cleaning machine, two trailer-mounted standard city sets, and a sewerodder. Originally, the city planned to amortize the equipment purchases over 10 years but found that much of it has paid for itself in just 2.5 years. Owning the equipment has also resulted in more flexible and efficient handling of sewer line repairs. (Kreager-FIRL)
W76-10687

WATER POLLUTION THROUGH RAIN OVERFLOWS FROM MIXED SEWERS (GEWASSERVERSCHMUTZUNG DURCH REGENUBERLAUFE AUS MISCHKANALISATIONEN),
For primary bibliographic entry see Field 5B.
W76-10688

FIVE PUMPS SALVAGE A QUEBEC SEWER JOB,
For primary bibliographic entry see Field 8C.
W76-10689

SEWERS - RELINING VS REPLACEMENT,
Grand Rapids City Engineer Office, Mich.
For primary bibliographic entry see Field 8G.
W76-10690

MARINE SANITATION DEVICE STANDARD,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol. 40, No. 198, p. 47972-74, October 10, 1975. 3 p.

Descriptors: *Federal Water Pollution Control Act, *Environmental sanitation, *Sewage disposal, Pollution abatement, *Waste water treatment, Federal jurisdiction, State jurisdiction, Water pollution, Treatment facilities, Waste treatment, Freshwater, Legislation, Water law, Standards, Flow characteristics, Waste water(Pollution), Lakes.
Identifiers: *Marine toilets, Administrative regulations, *FWPCA Amendments of 1972.

In October, 1975, the Environmental Protection Agency (EPA) proposed revision of 40 CFR Part 140, the Marine Sanitation Device Standard. This revision provides for a no-discharge standard for vessel sewage wastes in land-locked freshwater lakes, freshwater reservoirs, or other freshwater impoundments, or in rivers not capable of navigation by an interstate vessel on which a marine toilet facility has been installed. In all other navigable waters, U. S. Coast Guard certified flow-through treatment devices may be installed and operated on vessels. This approach is consistent with the EPA's focus on physical characteristics of water bodies. Section 312(f) of the Act provides mechanisms whereby individual states may obtain no-discharge regulations for specified water bodies. Under section 312(f)(3) any water within a state which is not included in the general no-discharge standard may be made no-discharge water by the state upon a showing that adequate pump-out and treatment facilities are reasonably available for all vessels plying such waters. (Reinders-Florida)
W76-10758

SOAP AND DETERGENT MANUFACTURING CATEGORY PRETREATMENT STANDARDS FOR NEW SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10759

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY, PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10760

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10761

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA SUBCATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10764

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS FOR NEW SOURCES FOR THE PHOSPHATE SUBCATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10768

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, ETHYLENE OXIDE, ETHYLENE GLYCOL, METHYL AMINES AND OXO CHEMICALS PROCESSES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10769

WATER PROGRAMS SECONDARY TREATMENT INFORMATION,
Environmental Protection Agency, Washington, D.C.
J. Quarles.
Federal Register, Vol 40, No 159, p 34522-23, August 15, 1975. 2 p.

Descriptors: *Waste water treatment, *Disinfection, *Chlorine, *Pathogenic bacteria, *Water quality standards, Municipal wastes, Coliforms, Domestic wastes, Public health, Bacteria, Sewage bacteria, Water pollution, Regulation, Administrative agencies, *Sewage treatment, Federal government, Inorganic compounds, Industrial wastes, Biological treatment.
Identifiers: *Carcinogens, Administrative regulations, FWPCA Amendments of 1972.

The Environmental Protection Agency (EPA) has proposed that the secondary treatment regulation be amended by deleting the effluent limitations for fecal coliform bacteria. The biological or physical/chemical processes used in secondary waste water treatment processes are not capable of making a significant reduction in pathogenic organisms. This reduction is typically accomplished by a disinfection process using chlorine or its derivatives. Since chlorine may form carcinogenic compounds, the EPA is discouraging uncontrolled or excessive use unless necessary for the protection of public health. Another proposed amendment is intended to clarify the effluent pH limitations. For effluents from physical/biological treatment processes followed by disinfection pH adjustments are not required. (Capehart-Florida)
W76-10770

DOMESTIC WASTEWATER DISINFECTION, SECONDARY TREATMENT,
Environmental Protection Agency, Washington, D.C.
J. Quarles.
Federal Register, Vol 40, No 159, p. 34524, August 15, 1975. 1 p.

Descriptors: *Domestic wastes, *Waste water treatment, *Water quality standards, *Disinfection, *Chlorination, Municipal wastes, Fisheries, Shellfish, Coliforms, Federal Water Pollution Control Act, Chlorine, Irrigation, Public health, Halogenated pesticides, Toxins, Toxicity, Bacteria, Sewage bacteria, Water pollution, Regulation, Administrative agencies, Water quality, Standards, Federal government, Sewage treatment.
Identifiers: *Carcinogens, Administrative regulations.

The Environmental Protection Agency has proposed amendments to the domestic waste water disinfection section of the regulation for secondary treatment by publicly owned treatment works. The amendment deletes the fecal coliform bacteria limitations from the definition of secondary treatment. Chlorine and chlorine-based compounds are widely used for disinfection of waste water. These compounds can form halogenated organic compounds which are potential carcinogens. In addition, chlorine residues can reach a level that is toxic to aquatic life. For these reasons, the benefits of chlorine disinfection should be balanced against the risks involved. Chlorine should be used only when public health hazards exist. The need for disinfection is to be established by water quality standards which shall take into consideration the protection of public water supplies, fisheries and shellfish waters, irrigation and agricultural waters, and waters where human contact is likely. (Capehart-Florida)
W76-10771

INK FORMULATING POINT SOURCE CATEGORY, PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10774

VARIANCES AND TEMPORARY PERMITS FOR OPERATION OF NON-CONFORMING SEWAGE DISPOSAL FACILITIES.
For primary bibliographic entry see Field 6E.
W76-10793

CHARACTERIZATION AND TREATMENT OF BRINE WASTEWATERS FROM THE CUCUMBER PICKLE INDUSTRY,
North Carolina Univ., at Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 3E.
W76-10805

FOAM FORMATION IN PLANTS FOR BIOLOGICAL PURIFICATION OF EFFLUENTS FROM THE MANUFACTURE OF KRAFT PULP (PENOOBRAZUVANETO V STANTSIITE ZA BIOLOGICHNO PRECHISTVANE NAOTPAD' CHITE VODI OT PROIZVODSTVOTO NA SULFATNATSELULOZA),
D. Baicheva, S. Bogoev, and M. Toneva.
Tseluloza i Khartiya, Vol. 6, No. 4, p 29-32, 1975. 1 fig, 4 ref, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Foaming, Wastes, *Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Municipal wastes, Lignins, Fibers(Plant), Stabilty, Biological treatment, Water purification.
Identifiers: Black liquors, Kraft mills, Sulfite pulp mills.

Effluents purified by the activated sludge method at the S. Kiradzhiev pulp and paper mill in Novi Krichim, Bulgaria, consist of wastes from the production of kraft and neutral sulfite pulps and kraft paper. A similar plant at the Razlog mill purifies a mixture of mechanically pretreated effluents from the manufacture of kraft pulp and paper, municipal sewage, and waste waters from the yeast-producing hydrolysis factory. Foaming at the Novi Krichim plant is intermittent, while at the Razlog plant it is a constant phenomenon, which cannot be controlled by the available mechanical means. Analyses were made of the foams at various stages of the purification process. In all samples, lignin and fibers were the main components. The foam samples also contained smaller amounts of activated sludge and substances extractable with ether. The foaming tendency and the foam stability of lignin (from black liquor), ether extractives (from concentrated black liquor), their 1:1 mixture, and of black liquor to which activated sludge and fibers had been added were investigated. The extractives caused the formation of large volumes of foam which is unstable. Lignin forms smaller amounts of foam, but this foam is stable and stabilizes the foam formed by the extractives. Activated sludge reduces the foaming in proportion to its amount, and this explains the lesser foaming in aeration tanks compared to the mixing tank. The action of fibers depends on their dimensions: small fibers stabilize foam, large fibers prevent its formation. The formation of stable foam at the Razlog purification plant is apparently due to the presence of large amounts of fines. (Stapinski-IPC)
W76-10833

REMOVAL OF SURFACE-ACTIVE AND OTHER SUBSTANCES CAUSING THE FORMATION OF STABLE FOAM DURING PURIFICATION OF EFFLUENTS FROM THE MANUFACTURE OF UNBLEACHED KRAFT PULP (OPITI ZA OTSTRANYAVANE NA POV'RKHNOSTNO-AKTIVNITE I DRUGI VESHCHESTVA, OBUSLAVYASHCHI OBRAZUVANETO NA USTOJCHIVA PYANA PRI PRECHISTVANETO NA OTPAD'CHNI VODI OT PROIZVODSTVOTO NA NEIZBELENA SULFATNA TSELULOZA),
D. Baicheva.
Tseluloza i Khartiya, Vol. 6, Noo. 5/6, p 19-24, 1975. 7 fig, 1 ref, 1 tab.

Descriptors: *Pulp wastes, *Lignins, *Flotation, *Waste water treatment, *Surfactants, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foaming, Coagulation, Color, Water pollution control, Flocculation, Water purification.
Identifiers: Aluminum sulfate, Foam control, Black liquors.

A previous study of foam formation in the biological purification plants of two Bulgarian pulp and paper mills has shown that lignin and small fibers are the main components of the effluents responsible for the formation of stable foam. A detailed description is given of laboratory experiments conducted on samples of effluents from the two mills containing various amounts of lignin, in which lignin and other surface-active agents were removed by pressure flotation with and without the use of coagulants and flocculants. Based on the results obtained, the following process is recommended: flotation under a pressure of 4 atmospheres with the addition of a coagulant (aluminum sulfate) to the flotation column. The amount of coagulant depends on the content of lignin in the effluent, a sufficient amount being 1 g aluminum/3.7-6 g lignin. Compared to other methods of foam control (mechanical, chemical antifoams), the proposed method has the advantage of simultaneously decolorizing the effluent and not introducing any chemicals that would increase water pollution or prevent the recycling of the purified effluent. The treatment should preferably be applied to effluents strongly contaminated with black liquor prior to their pooling with other kraft mill effluents. (Stapinski-IPC)
W76-10834

COAGULATION OF TEXTILE INDUSTRY EFFLUENTS WITH CATIONIC POLYELECTROLYTES (KOAGULACJA SCIEKOW PRZEMYSLU WLOKIENNICZEGO PRZY UZYCIU POLIELEKTROLITOW KATIONOWYCH),
Centralne Laboratorium Dziewiarstwa (Poland).
J. Rouba.
Przeglad Wlokienniczy, Vol. 29, No. 12, p 635-636, December, 1975. 5 ref, 3 tab.

Descriptors: *Textiles, *Waste water treatment, *Coagulation, *Polyelectrolytes, Waste treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Water purification, Dyes, Bleaching wastes, Color, Sediments, Flocculation, Cations.
Identifiers: Sedipur KA, *Cationic polyelectrolytes.

Experimental data are presented on the effectiveness of the cationic polyelectrolyte Sedipur KA (BASF) when used as coagulant for textile industry effluents. The chemical, in the form of a 1% solution, was used for coagulating combined concentrated effluents consisting of spent dyeing, bleaching, and plasticizing baths, and effluents from dyeing with direct and reactive dyes. In the first case, Sedipur KA gave complete decolorization and a good clarification at a dosage of 150 mg/cu dm. The chemical effectively decolorized effluents from direct dye dyeing (over 90%) along with clarification of the effluent. It was ineffective for spent reactive dye baths. The sediments had a tendency to flocculate rather than sediment; they were obtained in amounts considerably smaller than with the use of inorganic coagulants, and could be burned. (Stapinski-IPC)
W76-10836

FULL-SCALE TESTS OF AN INSTALLATION FOR PURIFICATION OF VISCOSE PRODUCTION EFFLUENTS BY ELECTROFLOTATION (PROIZVODSTVENNYE ISPYTANIYA USTANOVKI ELEKTROFLOTATSIONNOI OCHISTKI STOCHNYKH VOD VISKOZNYKH PROIZVODSTV),
Vsesoyuznyi Nauchno-Issledovatel'skii Institut Iskusstvennogo Volokna (All-Union Scientific Research Institute for Man-made Fibers), USSR.
M. A. Kraizman, G. N. Filippov, I. Z. Eifer, I. G. Shimko, and E. A. Shrader.
Khimicheskie Volokna, No. 5, p 37-40, 1975. 2 fig, 6 ref.

Descriptors: *Waste water treatment, Water pollution sources, Water pollution treatment, *Textiles, *Treatment facilities, Sedimentation, Flotation, Zinc, Metals, Electrolytes, Energy, Gases, Generators, Water purification, Wastes, Industrial wastes) Waste treatment, Heavy metals, Electrolysis, *Cellulose.
Identifiers: *Viscose rayon, *Electroflotation, Sodium hydroxide, Regenerated cellulose.

Production tests were completed on an experimental installation for the purification of viscose process effluents by electroflotation. The apparatus consists of a sedimentation tank, two flotation tanks with built-in electrolytic gas generators, an electrolyte circulation system, and a feed source. Determination of the process variables made it possible to remove 96-98% of the zinc from the effluents. Average energy consumption was 0.2-0.4 kw-hr/cu m, while electrolyte consumption (NaOH) was 1.5 g/amp-hr. (Chern-IPC)
W76-10837

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. PART 2. COAGULATION CHARACTERISTICS OF HEMICELLULOSE (IN JAPANESE),
Tokyo University, Japan, Faculty of Agriculture,
M. Jo, G. Meshitsuka, and J. Nakano.
Japan Tappi, Vol. 30, No. 2, p 107-112, February, 1976. 9 fig, 12 ref, 1 tab. (English summary)

Descriptors: *Coagulation, *Carbohydrates, *Sulfite liquors, Lignins, Water pollution sources, Flocculation, Separation techniques, Hydrogen ion concentration, Wastes, Industrial wastes, Adsorption, Pollutants, Chemical precipitation, Pulp wastes, Effluents.
Identifiers: *Hemicellulose, *Aluminum sulfate, Glucomannan, Xylan, Lignosulfonates, Sulfite pulp mills, Polysaccharides.

Because hemicelluloses are major pollutants in sulfite mill effluents, the coagulation of xylan and glucomannan by aluminum sulfate in the presence and absence of lignosulfonate was studied. The coagulation of xylan was less efficient and more pH-dependent than was that of glucomannan. The differences are attributed to glucuronic acid moieties. The presence of lignosufonate promoted hemicellulose coagulation, probably by adsorption of coflocculated lignosulfonate/alum precipitate. (See also W75-07636) (Brown-IPC)
W76-10839

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (3). DEGRADATION OF LIGNIN PREPARATION FROM WASTE LIQUOR OF OXYGEN-ALKALI PULPING (IN JAPANESE),
Nagoya University, Japan, Faculty of Agriculture.
H. Kawakami, and T. Kanda.
Japan Tappi, Vol. 30, No. 3, p 165-172, March, 1976. 7 fig, 16 ref, 8 tab. (English summary)

Descriptors: *Lignins, *Pulp wastes, *Microbial degradation, Wastes, Industrial wastes, Water pollution sources, Biodegradation, Pseudomonas, Aerobic bacteria, Amino acids, Nitrogen, Bacteria, Degradation(Decomposition), Pine trees.
Identifiers: Pseudomonas ovalis, Kraft lignin, Beech trees(Fagus), Guanine, Adenine, Chromatography, Vanillin, Syringaldehyde, Oxygen pulping process.

Lignin preparations (OL) isolated from spent oxygen-alkali pulping liquors are appreciably oxidized and have increased hydrophilicity. They were, therefore, more readily decomposed by Pseudomonas ovalis than were kraft lignin and sulfonated lignin. After 30 days incubation, the high molecular-weight fraction of pine and beech OL showed appreciable decomposition. The nitrogen content of residual lignin increased with prolonged incubation. The amino acid composition of the degraded lignin hydrolyzate differed from that of bacterial cells. Apparently about 10-20% of the nitrogen content in the biodegraded OL samples came from bacterial cell protein. However, treatment with Pronase (proteinase) did not significantly affect the samples' nitrogen content. Slight amounts of guanine and adenine (derived from bacterial nucleic acids) were detected by thin-layer chromatography, but no nucleic acids were detectable. Yields of vanillin and syringaldehyde from the biodegraded OL decreased considerably,

indicating a corresponding increase in the amounts of guaiacyl and biphenyl units condensed in the 5-position. The methoxyl and phenolic OH contents decreased with progressive bacterial degradation, whereas p-hydroxphenyl and 4-methoxy-isophthalic acid structures increased, as was observed previously for kraft lignin. The organism thus seemed to demethoxylate OL. (See also W75-11346 and W76-05485) (Brown-IPC)
W76-10840

A CLEAN PIECE OF PAPER,
Beak Consultants Ltd., Vancouver (British Columbia).
J. E. G. Sikes.
Unasylva, Vol. 27, No. 109, p 11-16, 1975. 2 illus, 3 tab.

Descriptors: *Pulp and paper industry, *Air pollution, *Water pollution control, Legislation, Water pollution treatment, Water pollution sources, Industrial wastes, Wastes, Costs, Reviews, Waste water treatment.
Identifiers: Closed systems.

The developments of the past decade in air and water pollution control for pulp and paper mills are surveyed, including legislation, and encouraging trends such as the development in the foreseeable future of closed water systems which will result in virtually no effluent discharge. Typical costs of water pollution control for various types and sizes of mills (bleached and unbleached kraft, newsprint, etc.) are given. (Witt-IPC)
W76-10842

PRODUCTION STUDIES ON THE ELECTROLYTIC METHOD OF RECOVERING ZINC FROM EFFLUENT SEDIMENTS (PROIZVODSTVENNYE ISSLEDOVANIYA ELEKTROLITICHESKOGO SPOSOBA REGENERATSII TSINKA IZ OSADKOV STOCHNYKH VOD),
Ukrainskii Institut Inzhenerov Vodnogo Khozaistva (USSR).
O. P. Sinev, A. I. Matsnev, N. P. Rossinskii, and A. I. Kuznetsov.
Khimicheskie Volokna, No. 5, p 41-43, 1975. 1 fig, 2 ref, 1 tab.

Descriptors: *Waste water treatment, *Zinc, *Electrolysis, Water pollution sources, Water pollution treatment, Leaching, Sedimentation, Flotation, Sediments, Sodium compounds, Wastes, Industrial wastes, Waste treatment, Separation techniques, Metals, Chemical wastes, Sludge treatment, Dewatering, Textiles, Heavy metals, Cellulose.
Identifiers: *Viscose rayon, Electroflotation, Sodium hydroxide, Sodium zincate, Regenerated cellulose.

A diagram is given of an experimental production-scale installation for the recovery of zinc from sediments of viscose process effluents. The apparatus consists of a reactor for leaching the sediment with NaOH solution, a vessel for separating undissolved admixtures from the sodium zincate by sedimentation or electroflotation, electrolysis baths, and a holding tank for spent alkali. The setup makes it possible to recover 75-85% of the zinc in the effluents, compared to 30% by the two-stage soda method. The loss of 15-25% of the zinc and NaOH (300-500 kg/ton of metallic zinc) takes place when the flotation sludge is dumped into a sludge holding tank. This loss can be reduced by dewatering the sludge. (Chern-IPC)
W76-10846

ADAPTATION OF FEED YEAST TO A CELLULOSIC EFFLUENT MEDIUM (IN ARMENIAN WITH RUSSIAN SUMMARY),
L. G. Petrosyan, R. M. Akhinyan, and F. G. Sarukhanyan.
Izvestiya Sel'skokhozyaistvennykh Nauk, Vol. 17, No. 10, p 93-95, 1974. 2 tab.

Descriptors: *Yeasts, *Waste water treatment, *Cellulose, *Water pollution sources, Wastes, Industrial wastes, Filters, Effluents, Hydrolysis, Chemical degradation, Nutrients, Water pollution control, Waste water disposal, Waste treatment, Carbohydrates, Textiles.
Identifiers: *Cellulose acetate, Monosaccharides.

At the Armenian Kirovakan synthetic fiber factory, effluents from the production of cellulose acetate as well as the filters are discharged without treatment. Cellulose constitutes 94% of the effluent material. Following hydrolysis to monosaccharides, the effluents could be used as a nutrient medium for several strains of feed yeast. The yield of the yeast cells was 52.46-96.54%, based on sugars. (Stapinski-IPC)
W76-10847

USE OF ELECTRODIALYSIS IN THE WATER RECYCLING SYSTEM OF VISCOSE PRODUCTION (PRIMENENIE ELEKTRODIALIZA V SISTEME VODOOBOROTA VISKOZNOGO PROIZODSTVA),
Cherkasskii Zavod Khimicheskogo Volokna (USSR).
A. I. Artyukhov, M. A. Kraizman, I. Z. Eifer, I. G. Shimko, and E. F. Yastreb.
Khimicheskie Volokna, No. 6, p 36-39, 1975. 4 fig, 7 ref.

Descriptors: *Waste water treatment, *Water reuse, *Electrodialysis, Wastes, Industrial wastes, Water pollution sources, Demineralization, Water purification, Separation techniques, Waste treatment, Water pollution treatment, Water quality control, Sodium sulfate, Electric power, Pressure, Textiles, Cellulose, Recirculated water, Reclaimed water, *Recycling.
Identifiers: Viscose rayon.

A diagram and description are given of a wash water recycling system at the Cherkassk man-made fiber factory in which demineralization is accomplished by electrodialysis. Power consumption decreased sharply with increasing pressure in the water circuit (0.05 to 0.15 MPa) and decreasing potential (450-350 volts). Optimum degree of demineralization was 0.5 g/liter of sodium sulfate (from 3 g/liter). This required a power consumption of 5 kw-hr/cu m. Output was 50 cu m/day. (Chern-IPC)
W76-10848

ENVIRONMENTAL PROTECTION INSTALLATIONS OF CELLULOSE ATTISHOLZ AG. (UMWELTSCHUTZANLAGEN DER CELLULOSE ATTISHOLZ AG.).
Wochenblatt fuer Papierfabrikation, Vol. 104, No. 5, p 178, 180, March 15, 1976. 1 fig, 1 illus.

Descriptors: *Pulp wastes, *Treatment facilities, *Waste water treatment, Waste treatment, Alcohols, Yeasts, Evaporation, Incineration, Waste disposal, Water purification, Biological treatment, Dewatering, Sludge disposal, Bark, Wood wastes, Europe.
Identifiers: *Cellulose Attisholz AG.(Switzerland).

On November 20, 1975, Cellulose Attisholz AG. in Switzerland hosted a public viewing of their environmental protection installations, notably the fourth stage of a series. In 1914 they established a plant for making alcohol from the effluents, in 1944 a yeast plant, and in 1962 an evaporation and combustion system. The present installation, which is described here, comprises a mechanical-chemical purification stage, a biological treatment stage, and a dewatering and combustion stage for sludge and bark residues. (Ward-IPC)
W76-10849

BIOLOGICAL FILTERS (BIOLOGICHESKIE FIL'TRY),
S. V. Yakovlev, and Yu. V. Voronov.
Stroizdat, Moscow, 1975. 136 p. 55 fig, 48 ref, 37 tab.

Descriptors: *Biological membranes, *Filters, *Waste water treatment, Sewage treatment, Waste treatment, Water purification, Design, Operation and maintenance, Foreign research, Construction, Biological treatment, Membranes, Industrial wastes, Equipment, Treatment facilities, Filtration, *Biological treatment.
Identifiers: Soviet Union(USSR), *Biological filters.

This book deals with the purification of sewage and industrial effluents on biological filters, the types of filters, and their design, theory, and operation. The material is presented in the following four chapters: Soviet and Foreign experience with the use of biological filters (types of filters and their classification, filling materials, immersible filters, high-capacity filters); Biological filters of modern construction; Design of biological filters (including general requirements, calculations, and design of biological purification plants); and Recommendations concerning start-up and operation of biological filters. (Stapinski-IPC)
W76-10850

POLLUTION CONTROL THROUGH UTILIZATION OF SPENT SULFITE LIQUORS FROM THE PULP INDUSTRY AS ORGANIC NITROGEN FERTILIZER (EIN BEITRAG ZUR UMWELTFREUNDLICHEN TECHNIK DURCH VERWERTUNG DER SULFITABLAUGEN DER ZELLSTOFFINDUSTRIE ALS ORGANISCHER STICKSTOFFDUENGER),
W. Flaig, and H. Sochtig.
Netherlands Journal of Agriculture Science, Vol. 22, No. 4, p 255-261, 1974. 2 fig, 14 ref, 1 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Fertilizers, Water pollution control, Ammonification, Nitrogen, Water pollution sources, Industrial wastes, Wastes, Lignins, Organic compounds.
Identifiers: Spent pulping liquors.

Organic fertilizer with a nitrogen content of 18-20% can be produced from spent sulfite liquors through oxidative ammonification. The nitrogen occurs in various forms. Pot experiments with N-lignins obtained using different amounts of oxygen during oxidation showed that products obtained at an oxygen consumption of about 13 moles/kg serve best as a source of nitrogen for plants. Substances are contained in the N-lignins which inhibit nitrification. As a result, not only is the content of nitrates in fast-growing plants reduced, but also the deposition of nitrogen in the form of nitrate ions. The physical properties of the fertilizer can play a role in the transfer of nitrogen from N-lignin into the deeper soil layers. (Speckhard-IPC)
W76-10851

TRENDS AND EXPERIENCE IN THE PRIMARY TREATMENT OF PAPERMAKING EFFLUENTS (INDIRIZZI ED ESPERIENZE NEL TRATTAMENTO PRIMARIO DELLE ACQUE DI SCARICO DELLE CARTIERE),
A. Santangelo.
Il Cartaio, No. 1, p 3-8, January/February, 1976. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Sedimentation, Wastes, Industrial wastes, Water pollution treatment, Sewage treatment, Water pollution sources, Waste treatment, Lime, Flocculation, Zeta potential, *Flotation, Water pollution control, Separation techniques, Effluents.
Identifiers: Aluminum sulfate.

This discussion mainly concerns the sedimentation process for treating paper mill effluents, particularly the recommended additions of aluminum sulfate, lime, and flocculating agents for various

classes of effluents, the theory of sedimentation, the role of zeta-potential, and advantages of the sedimentation process. Flotation treatment of effluents is also mentioned. (Speckhard-IPC)
W76-10852

REASONS FOR HAVING THE IVL-INSTITUTE FOR WATER AND AIR POLLUTION CONTROL RESEARCH. (VARFOR ETT IVL-INSTITUT FOR VATTEN- OCH LUFTVARDSFORSKNING.),
For primary bibliographic entry see Field 5G.
W76-10853

SEQUENTIAL TREATMENT OF KRAFT PULP WASHING WASTEWATER BY PILOT PLANT: ACTIVATED SLUDGE TREATMENT, LIME TREATMENT, AND ACTIVATED CARBON ADSORPTION TREATMENT (IN JAPANESE),
Japan Government Industrial Research Inst., Shikoku.
T. Fujii, H. Kabeya, H. Kamishima, T. Kubo, and J. Hosokawa.
Japan Tappi, Vol. 30, No. 2, p 94-106, February 1976. 10 fig, 15 ref, 8 tab. (English summary).

Descriptors: *Pulp wastes, *Activated sludge, *Lime, *Activated carbon, *Waste water treatment, *Pilot plants, Foreign research, Lignins, Color, Chemical oxygen demand, Adsorption, Separation techniques, Tertiary treatment, Recycling, Waste treatment, Wastes, Industrial wastes, Water pollution sources, Industrial water.
Identifiers: Wash water, Kraft mills, *Japan.

High-intensity purification of brown stock wash waters for recirculation purposes was studied for 45 days in a pilot plant, using activated sludge, lime precipitation, and activated carbon techniques in succession. The fixed-bed activated carbon adsorption system comprised 6 columns, each 2 m long and 15 cm in diameter, filled with granular carbon of 8-30 mesh. The effluent was passed through at a flow rate of 60 liters/hr. The untreated wash water contained about 400 ppm COD, 280 ppm lignin, and 2400 Pt units of color. Combined activated sludge and lime treatments removed about 90% COD and color and about 85% lignin. The activated carbon 3rd stage resulted in colorless water of very low COD, suitable for recycling. (Brown-IPC)
W76-10854

FOAM SEPARATION FOR DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 458-472, March, 1976. 7 fig, 17 ref, 13 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Toxicity, *Foam separation, *Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Hydrogen ion concentration, Water purification, Water pollution control, Separation techniques, Waste treatment, Water quality control, Bleaching wastes, Suspended solids.
Identifiers: Kraft mills, White water(Paper machines).

Foam separation has been successfully developed on a laboratory and small pilot-plant scale as a novel process to detoxify bleached kraft mill effluents. Factors controlling detoxification efficiency include pH, contact time, gas-liquid interfacial area, initial level of toxicity, and the absence of inhibitive chemicals. Foam separation is effective on whole mill effluent but ineffective on unbleached white water or acid bleach effluent alone because of the poor foaming characteristics. During a reliability test, 83% of the 205 samples from 10 mills were detoxified. A continuous two-stage system detoxified 92% of the samples at pH 8, 1-hr retention time, and a gas:liquid ratio of 9:1. Modifications of the process reduce the foam volume to be removed for complete detoxification to less than 3%. The discharged foam may be effectively combined with the removal of suspended solids. (Witt-IPC)
W76-10855

TOUGH ILLINOIS EFFLUENT STANDARDS ARE MET BY CELOTEX BOXBOARD MILL,
For primary bibliographic entry see Field 5G.
W76-10856

TOWN GIVES PRIMARY AND SECONDARY TREATMENT TO BLANDIN'S EFFLUENT,
Grand Rapids Industrial Waste Plant, Minn.
J. Jetland.
Pulp and Paper, Vol. 50, No. 3, p 132-133, March, 1976. 4 fig.

Descriptors: *Pulp wastes, *Minnesota, *Waste water treatment, *Treatment facilities, *Sewage treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water pollution control, Municipal wastes, Flocculation, Sedimentation, Water purification, Aeration, Lagoons, Sludge, Dewatering, Chlorination, Aerated lagoons.
Identifiers: Eimco clarifiers, Grand Rapids(Minn).

Grand Rapids, Minnesota, maintains and operates an effluent and sewage treatment plant capable of treating 1.5 million gallons/day of domestic wastes and 11 million gallons/day of wastes from Blandin Paper Company. Mill effluent is given primary and secondary treatment in a separate section of the town plant. The primary treatment consists of flocculation in two 50 x 20-ft tanks, 16-ft deep, and sedimentation in two 110-ft-diameter 8-ft deep Eimco clarifiers. Aeration provides agitation in the flocculation tanks. Overflow from the domestic and industrial primary clarifiers is combined and pumped to the secondary plant. Two lagoons receive the primary effluent and return activated sludge. Effluent from the lagoons goes to two Eimco clarifiers. There sludge is settled out for return to the lagoons or return to the primary plant for dewatering. Overflow is pumped to the next lagoons for further aeration. The liquor then flows by gravity to a third set of lagoons for chlorination and final settling. The six treatment basins contain almost 90 million gallons at design high water level. (Sykes-IPC)
W76-10857

SEQUENTIAL CHLORINATION -- IMPACT ON THE ENVIRONMENT,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
R. J. Gall, H. D. Partridge, D. J. Jaszka, and G. R. Roseman.
Tappi, Vol. 59, No. 4, p 122-125, April, 1976. 4 fig, 28 ref, 4 tab.

Descriptors: *Water pollution control, *Bleaching wastes, *Pulp and paper industry, *Chlorination, Water pollution sources, Chemical oxygen demand, Chlorides, Color, Costs, Recycling, Sodium chloride, Sodium sulfate, Softwood, Incineration, Organic loading, Effluents.
Identifiers: Kraft mills, Chlorine dioxide, Kraft pulp, White liquor(Kraft-process), Chemical recovery.

Sequential chlorination of softwood kraft pulp reduces the amount of pollutants in the bleach plant effluent. The level of reduction depends on the degree to which chlorine is replaced by chlorine dioxide. Sequential chlorination may be coupled with existing external and internal treatment processes. A new alternative, predicated on sequential chlorination and effluent-recycling semiclosed loop system, is proposed so that the projected Environmental Protection Agency guidelines may be met. A high chlorine dioxide replacement ratio is recommended, followed by an alkaline extraction with caustic or oxidized white liquor. This combination yields a low level of chlorides in the extraction liquor and thus permits its recycling to the recovery system where the major organic pollutant loads are incinerated and caustic is recovered. The low volume of effluent from the sequential stage is treated in a resin-packed column to further reduce its color and COD. A salt separation process is used to control the sodium chloride level in the recovery system and to separate sodium sulfate from the precipitator dust. The process may be implemented in a series of steps to give a programmed reduction of pollutants. These reductions in amount of effluent pollutats are projected to involve equivalent or slightly lower chemical costs than previously used methods. (Sykes-IPC)
W76-10860

ENVIRONMENTAL AND SOCIAL FACTORS (IN THE PAPER INDUSTRY),
Crown Zellerbach Corporation, Camas, Wash.
For primary bibliographic entry see Field 5G.
W76-10861

HOW TO MEET WATER CLEANUP DEADLINES,
Ecodyne Corp., Union, N. J.
R. K. Schmidt.
Environmental Science and Technology, Vol. 10, No. 2, p 140-143, February, 1976. 2 fig, 2 illus.

Descriptors: *Waste water treatment, *Food processing industry, *Pulp and paper industry, Sewage treatment, Tertiary treatment, Equipment, Water pollution treatment, Water pollution control, Waste treatment, Wastes, Water pollution sources, Water purification, Suspended solids, Biological treatment, Lagoons, Biochemical oxygen demand, Filtration, Chemical precipitation, Color, Water quality standards, Regulation, Effluents.
Identifiers: Steel industry.

Primary, secondary, and tertiary waste water treatment processes are discussed briefly with respect to objectives and equipment. In general, progressing from primary to tertiary treatment involves more complex application technology and invariably higher expense. Basic effluent treatment processes used by steel mills, plating mills, food-processing plants, and pulp and paper mills are also discussed. The waste water treatment technology presently in use at most paper mills includes primary clarification for suspended solids removal, followed by biological treatment, which for the most part consists of stabilization lagoons for BOD removal. The 1977 Environmental Protection Agency standards require paper mills to filter the effluent from the ponds to remove trace suspended solids before discharge. A physical/chemical process (chemical addition and precipitation in a clarifier) is being used to remove color from paper mill effluents. Diagrams are included illustrating waste water treatment processes at a steel mill, pulp and paper mill, and food processing plant. (Witt-IPC)
W76-10862

DETOXIFICATION OF BLEACHED KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. C. Mueller, and C. C. Walden.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 502-510, March, 1976.

Descriptors: *Biological treatment, *Pulp wastes, *Toxicity, *Waste water treatment, Waste treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Aerated lagoons, Activated sludge, Biochemical oxygen demand, Foam fractionation, Mixing, Nutrients, Water purification, Water pollution control.
Identifiers: Kraft mills.

Factors affecting the performance of various conventional and modified biotreatment systems on bleached kraft effluents have been assessed. A conventional 5-day aerated lagoon, a 24-hr extended activated sludge system, and a 6-hr activated sludge system removed 74, 72, and 81% of the 5-day BOD, respectively, while detoxifying effluents only 52, 85, and 68% of the time. Modification to conventional systems involving partial detoxification of effluents by foam fractionation before biotreatment, or improved mixing during biotreatment, enhanced 5-day BOD removal and detoxification success rates to 90% or better. Biological systems effectively and consistently remove 5-day BOD and toxicity from bleached kraft mill effluents when protected against toxicity shocks by surge equalization or prior foam fractionation. Adequate nutrient levels and mixing also are essential to detoxification performance. (Witt-IPC)
W76-10867

PURIFICATION OF LIGNOSULFONATES BY DYNAMIC MEMBRANE ULTRAFILTRATION,
Institute of Paper Chemistry, Appleton, Wis.
J. W. Collins, A. A. Webb, and A. J. Wiley.
Ion Exchange and Membranes, Vol. 2, No. 2, p 91-98, 1975. 9 fig, 13 ref, 7 tab.

Descriptors: *Sulfite liquors, *Lignins, *Reverse osmosis, *Waste water treatment, Membrane processes, Separation techniques, Waste treatment, Wastes, Industrial wastes, Water pollution sources, Temperature, Tertiary treatment, Water quality control, Pulp wastes, Water pollution treatment, Membranes, Water pollution control, Carbon, Operation and maintenance, Filtration.
Identifiers: *Lignosulfonates, Spent pulping liquors, *Ultrafiltration.

The lignosulfonates of calcium-base spent sulfite liquor were concentrated by ultrafiltration through dynamic membranes on sand log module which had been pretreated with spent sulfite liquor and small amounts of powdered carbon. The process, which does not use cellulose acetate or other cast membranes, could be operated at temperatures as high as 90C. Rejection and flux properties were not greatly different from those of a conventional cellulose acetate membrane. (Buchanan-IPC)
W76-10868

UNIQUE PROCESS FOR SULFITE SPENT LIQUOR KEEPS OLDER MILL VIABLE,
J. C. W. Evans.
Pulp and Paper, Vol. 49, No. 10, p 63-65, September, 1975. 1 fig, 6 illus.

Descriptors: *Sulfite liquors, *Pulp wastes, *Waste water treatment, *Incineration, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Evaporation, Oxidation, Sodium sulfate, Hardwood, Waste water disposal, Hardwood, New York.
Identifiers: Marathon Engineering direct evaporator, Goslin-Birmingham evaporator, Broby furnace, Sulfite pulp mills.

Spent liquor from the sodium bisulfite high-yield hardwood pulping operation at Georgia-Pacific Corporation's Lyons Falls, New York, mill is processed in a Marathon Engineering Inc. multiple-effect direct evaporator system. The liquor is thickened from 8% to 18% in a Goslin-Birmingham vacuum evaporator. The 18% liquor is fed into a venturi scrubber where it is contacted by flue gas from the Broby furnace and raised to 60% solids. The thickened liquor is sprayed into the top of the Modified Broby furnace where it is burned. It then falls to a bed at the bottom where combustion is completed under oxidizing conditions. The resulting smelt passes between water-cooled rolls to produce a thin flake which is broken up, stored in a silo, and eventually sold to kraft mills as a replacement for saltcake. (Sykes-IPC)
W76-10871

ELECTROCHEMICAL PRODUCTION OF FREE RADICALS FOR WASTEWATER TREATMENT,
Missouri Univ., Columbia. Dept. of Civil Engineering.
L. Hemphill, and M. Clark.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 794, $4.00 in paper copy, $3.00 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, May 20, 1976. 31 p, 8 fig, 3 tab, 11 ref. OWRT A-082-MO(1), 14-31-0001-4025.

Descriptors: *Electrolysis, *Waste water treatment, *Kinetics, *Oxidation, *Chemical reactions, Gamma radiation, Phenols, Sewage, Chemical oxygen demand, Colorimetry.
Identifiers: *Radiolysis, Plasma radiolysis, Glow discharge electrolysis, *Organic oxidation, Organic carbon, Free radical oxidation.

The purpose was to determine the nature and kinetics of aqueous free radical oxidation reactions produced by glow discharge electrolysis (GDE) and 60 Co gamma irradiation. Results showed that phenolic solutions and domestic wastewater were oxidized by GDE and gamma radiation produced free radicals. Direct comparison of the free radical oxidation produced by GDE and 60 Co gamma irradiation indicated organic oxidation was a first order reaction and GDE was more efficient. Comparison of chemical dosimetry (Fricke) results showed that a laboratory GDE reactor apparatus produced a radiation dose rate equivalent to about one third of the radiation dose rate of a kilocurie 60 Co source. Radiolysis decay of phenol solutions by 60 Co and GDE proceeded at a rate proportional to the chemical dosimeter (Fricke) determined values for each source. Design of GDE reactors and associated equipment is described. Domestic waste water GDE radiolysis is a typical first order reaction.
W76-10876

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-255 818, $12.00 in paper copy, $3.00 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 76-204, July 1976, 462 p.

Descriptors: *Water reuse, *Bibliographies, *Recycling, Reclaimed water, *Sewage treatment, Water conservation, *Waste water treatment, Water treatment, Industrial wastes.

This report, containing 301 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). Volumes 1 through 4 cover the material announced in SWRA from October 1968 through January 1972 (See W75-06639, W75-06638, W73-11702 and W73-11701). At the time of search for this bibliography, the data base had 95,781 abstracts covering SWRA through April 15, 1976 (Volume 9, Number 8). Author and subject indexes are included.
W76-10878

TOXICITY OF CHLORINATED POWER PLANT CONDENSER COOLING WATERS TO FISH,
Michigan Water Resources Commission, East Lansing; and Michigan Bureau of Water Management, East Lansing.
For primary bibliographic entry see Field 5C.
W76-10896

COMPARATIVE TOXICITY OF SEWAGE-EFFLUENT DISINFECTION TO FRESHWATER AQUATIC LIFE,
Environmental Research Lab., Duluth, Minn.
For primary bibliographic entry see Field 5C.
W76-10898

DESIGN OF ALTERNATING DIFFUSER PIPES,
Skopje Univ. (Yugoslavia).
For primary bibliographic entry see Field 8B.
W76-10952

METAL RECOVERY FROM WASTE TREATMENT SLUDGES,
Dart Environment and Services Co., Los Angeles, Calif. (Assignee).
L. E. Lancy.
U. S. Patent No. 3,953,306, 6 p, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1840, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Water pollution control, Metals, Sludges, Sludge treatment, Alkalis(Bases), Economic efficiency.
Identifiers: Metal plating industry, *Metal recovery.

This invention pertains to the recovery of metal values from waste streams and in particular to the separate recovery of metals in a useful form. The regulatory requirements to precipitate these metals and remove them from the effluent stream to minimize pollution, create an even greater cost for the operation of these processes because the precipitated metal is in the form of thin slurry sludges and the removal of sludges to the waste disposal area is usually the most expensive part of the waste treatment operation. Additionally, the area in which metal sludges are allowed to be deposited is continually shrinking making a problem of ultimate disposal. This invention is an improved process for preparing highly concentrated salt solutions of metals of high purity from waste metal sludges at superior dissolution rates and is achieved by preparing, concentrating and washing the sludge containing insoluble metal hydroxide under specific conditions to safeguard against the solids being exposed to air or dried out. The wet sludge is then dissoved in a dilute acid. The resultant solution can be used directly e.g. as make up in many electrolytic metal finishing processes to compensate for drag out losses occurred, or as the primary metal source in electrolytic processes employing insoluble anodes. Other specific uses for the process include the preparation of aluminum sulfate coagulants. (Sinha-OEIS)
W76-10960

OXYGEN AERATION SYSTEM FOR CONTAMINATED LIQUIDS,
H. Reimann.
U.S. Patent No. 3,953,326, 6 p, 7 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1846, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment, Water pollution control, Water quality control, Organic wastes, Biochemical oxygen demand, Aeration, Carbon dioxide, Recycling, Activated sludge.

A system is provided for the purification of an organically contaminated liquid, the purifying effect of which is chronologically approximately constant, even in the case of high BOD concentrations of the liquid. The process of this invention provides a simple control of the CO2 concentration in the aeration tank, i.e. that concentration which otherwise prevents a constant rate of purification, by stripping out, by mass transfer with gas, the CO2 obtained in the aeration tank continuously at least from a portion of the matter present or recycle to the aeration tank. This has the result that the pH value of the liquid-sludge mixture in the aeration tank remains constant, and the efficiency of the total oxygen utilization is not adversely affected. Air is preferred for stripping. The stripping

of the liquid can be conducted within or outside of the aeration tank. When stripping within the aeration tank, it is accomplished by producing a liquid current and blowing or stirring the air into this current. At the end of this directed gaseous flow, the gaseous mixture is withdrawn from the aeration tank, while the liquid current, now extensively freed of metabolic products is readmixed to the residual mixture in the aeration tank. When conducting the stripping step outside of the aeration tank, a partial stream of the recycle activated sludge and/or liquid-sludge mixture is withdrawn from the aeration tank, stripped in mass transfer with air in a suitable stripping unit, and after being extensively freed of metabolic products, recycled into the aeration tank. (Sinha - OEIS)
W76-10961

WATER-SOLUBLE CATIONIC POLYMERIC MATERIALS AND THEIR USE,
Betz Labs, Inc., Trevose, Pa. (Assignee).
R. G. Tonkyn, N. Vorchheimer, W. J. Fowler, Jr., and R. A. Heberle.
U. S. Patent No. 3,953,330, 9 p, 8 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1848, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Industrial wastes, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, Suspended solids, Coagulation, Flocculation, *Polymers, Water reuse, Economics, Cations.

Because of pollutional requirements and requirements for economic processing of aqueous waste streams, it has been necessary to treat both municipal and industrial waters to remove as much of the suspended organic and/or inorganic matter as possible. Similarly, in the ore processing and refining industries, as in some pulp and paper mill systems, it is necessary to remove fines and fibers from the aqueous systems in each to permit water conservation and reuse and/or to insure that the water is acceptable for discharge. Sedimentation, filtration, centrifugation processes, although acceptable in some instances, are generally too slow and costly when substantial volumes of water are to be treated. There has been a consistent increase in the effort to develop and produce materials which will operate to effectively coagulate or flocculate suspended matter more rapidly and at lower dosage rates to thereby provide improved economics. It was discovered that the flocculation and coagulation of suspended matter could be effectively achieved by utilizing a water-soluble cationic polymer obtained by the polymerization of an epithalohydrin with a specific family of alkylene polyamine, the polymerization being carried out under certain conditions and utilizing specific concentrations of the respective ingredients. (Sinha - OEIS)
W76-10964

PURIFICATION OF WASTE WATER CONTAINING ORGANIC AND INORGANIC IMPURITIES,
Ruhrchemie Aktiengesellschaft, Oberhausen (West Germany). (Assignee).
S. Speth, G. Kuppenbender, and W. Jansen.
U. S. Patent No. 3,953,332, 5 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1848-1849, April 27, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Industrial wastes, *Water pollution treatment, Water pollution control, Water quality control, Separation techniques, Flow separation, Organic wastes, Inorganic compounds, Flocculation, Skimming, Temperature, Equipment.
Identifiers: Gravity separator.

This invention relates to the purification of waste water and the separation of light water insoluble organic liquids and water insoluble solids which flocculate in the presence of such water insoluble liquids. The components are introduced into an introduction zone of the gravity separator. Thereafter they pass into a separation zone where separation of the water from the organic and solid components takes place. By adjusting the temperature of the materials in the introduction zone undesired flocculation in the separation zone can be presented so that there are formed two distinct sludge phases, a sedimented heavy sludge phase which rapidly settles to the bottom of the gravity separator and a lighter, but more distinct swimming sludge phase. This lighter swimming sludge phase is lighter than the water phase and can be removed from the surface of the water in the introduction zone of the separator by a skimming type operation. The water phase can then be removed by passing it over a weir. Thus, with the process of the invention, consecutive flocculation which would result in the formation of solid particles of large surface area having high adsorption capacity for the organic impurities during the contact time, is prevented. (Sinha-OEIS)
W76-10966

ELECTROCHEMICAL CELL FOR DECREASING THE CYANIDE AND HEAVY METAL CONTENT OF AN AQUEOUS SOLUTION,
Rockwell International Corp., El Segundo, Calif. (Assignee).
H. L. Recht.
U. S. Patent No. 3,954,594, 5 p, 1 fig, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 240, May 4, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Heavy metals, Water pollution sources, Water purification, Separation techniques, Electrolysis, Oxidation, Reduction(Chemical), Anodes, Cathodes, Electrochemistry.
Identifiers: *Cyanides, Electrochemical cell.

It has been found that both the cyanide and heavy metal content of a waste water may be concurrently reduced utilizing a certain electrochemical cell. The cell is provided with separate cathode and anode compartments. Each of the compartments contains a bed of electrically conductive particles. The compartments are separated by an electronically nonconductive foraminous member. In accordance with the method, the aqueous solution containing cyanide ion and at least one heavy metal in soluble form is passed sequentially through the beds of electrically conductive particles contained in each of the two compartments of the cell. A direct electric current is passed between the two compartments making one compartment cathodic and the other anodic. The heavy metal is deposited upon the particles in the cathodic compartment and the cyanide is oxidized in the anodic compartment. The wastewater having a substantially reduced cyanide and heavy metal content is then discharged from the electrochemical cell. (Sinha-OEIS)
W76-10972

FILTER APPARATUS,
R. F. Worlidge.
U. S. Patent No. 3,954,613, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 246, May 4, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, *Water pollution treatment, *Filtration, *Filters, Separation techniques, Cleaning, Flow control.

In the fields of pollution control, effluent treatment and sewage treatment, the separation of solids from liquids or the concentration of solids into a smaller volume of liquid has presented a problem which has been difficult to solve effectively where the nature of the solids to be removed or concentrated is such that a very thin layer of solids deposited on a filter media seals the passages to such a degree that the media becomes blocked. In this invention a nozzle is arranged adjacent the filter screen. A variable speed drive causes relative movement between the filter screen and the nozzle such that deposited solids are removed from successive portions of the filter screen and a control unit controls the speed of the relative movement in dependence upon the degree of blockage of the filter screen. Throttling the discharge of the filtered liquid causes liquid to flow from the side of the filter screen remote from the nozzle back through the screen into the nozzle which is provided with an inlet having an adjustable cross-sectional area for varying the flow. A cleaning system arranged to direct clean liquid through the filter screen into the nozzle is provided for cleaning the screen should the screen become completely blocked. (Sinha-OEIS)
W76-10975

FILTRATION AND BACKWASHING APPARATUS FOR USE WITH A WATER FILTRATION SYSTEM,
Hydrotechnic Corp., New York. (Assignee).
For primary bibliographic entry see Field 5F.
W76-10977

WATER SUPPLY FOR THE GREATER NEW YORK METROPOLITAN AREA,
Corps of Engineers, New York. Northeastern U.S. Water Supply Study.
For primary bibliographic entry see Field 6B.
W76-10983

THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOODCHAIN STUDIES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10986

REMOVAL OF INORGANIC NITROGEN IN AN INTEGRATED FOOD CHAIN SYSTEM,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10988

RELATIVE GROWTH OF DIFFERENT SPECIES OF MARINE ALGAE IN WASTEWATER-SEAWATER MIXTURES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10989

THE USE OF POWER PLANT WASTE HEAT IN MARINE AQUACULTURE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. E. Huguenin, and J. H. Ryther.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 196-220. 2 fig., 1 tab., 16 ref.

Descriptors: *Feasibility, *Aquiculture, *Cooling water, *Water reuse, Period of growth, Heated water, Commercial fish, Commercial shellfish, Hazards, Pilot plants, Public health, Fish diseases, Animal parasites, Marketing, Political constraints, Regulation, Legal aspects.
Identifiers: Sea food farming, Powerplant fish hatcheries.

The feasibility and inherent drawbacks of using power plant cooling water for marine aquaculture are discussed. The benefits are increased periods of growth, accelerated growth, the ability to control water temperature, especially in areas with great seasonal changes in water temperature, and

raising species outside of their normal range. Several pioneering projects conducted at nuclear and fossil fuel plants in Maine, Florida, New York, California, Connecticut, Texas, Scotland, England, and Japan are described. Disadvantages include dependence on continuing power plant operation and schedules, increased risk of diseases, predators, and parasites, the problems of nitrogen and oxygen supersaturation, unfavorable changes in product quality, and uptake of biological and chemical pollutants deleterious to human health. Other deterrents may be that the elimination of pronounced seasonal water temperature variations may alter the organisms' natural life cycles with unknown long range consequences, as well as the discharge of aquaculture wastes, and the necessity of handling large volumes of water. Large scale thermal aquaculture may be limited more by legal, political, and regulatory factors than by technical considerations. Continued research involving both hardware and procedures is necessary to give assurance of product quality and economic efficiency. (See also W76-10986) (Auen-Wisconsin).
W76-10992

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. I. MONITORING DURING PILOT OPERATION,
Woods Hole Oceanographic Institution, Mass.
W. B. Kerfoot, and S. A. Jacobs.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 224-242. 2 fig., 3 tab., 24 ref. NSF-RANN-32140.

Descriptors: *Heavy metals, *Domestic wastes, *Tertiary treatment, *Sewage effluens, *Aquiculture, *Oysters, Lead, Nickel, Cadmium, Copper, Zinc, Chromium, Sea water, Pilot plants, Dilution, Safety, Marine algae, Design, Absorption.
Identifiers: Sea food farming.

Concentrations of heavy metals (zinc, copper, cadmium, chromium, lead, and nickel) were determined in effluents from the Otis Air Force Base Sewage Treatment Plant, seawater, and oysters grown in a pilot sewage treatment-marine aquaculture system. The effluent metal content was less than that usually found in secondary effluents, except that copper was occassionally above normal. Except for nickel (which was the same as in seawater), metal concentrations were generally 8-150 times the level found in seawater. The metal concentrations in oysters declined from the 45th day of culture; zinc, copper, and lead levels remained essentially constant, while cadmium, chromium, and nickel decreased slightly. Lack of metal accumulation was due to dilution of effluent by seawater, the relatively low metal content of the Otis effluent, and the increased growth of the oysters. The 102-day study showed that oysters can be rown with secondary effluent as a substitute fertilizer without danger of metal contamination. The initial results suggest that inherent elevated metal concentrations in domestic wastewater do not pose a threat to shellfish culture if effluent of a principally domestic source is used. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10993

PERMISSIBLE LEVELS OF HEAVY METALS IN SECONDARY EFFLUENT FOR USE IN A COMBINED SEWAGE TREATMENT-MARINE AQUACULTURE SYSTEM. II. DEVELOPMENT OF GUIDELINES BY METHODS, OF ADDITIONS,
Woods Hole Oceanographic Institution, Mass.
W. B. Kerfoot, and G. A. Redmann.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 243-271. 7 fig., 2 tab., 23 ref.

Descriptors: *Heavy metals, *Sewage effluents, *Standards, *Aquiculture, *Oysters, Marine algae, Lead, Nickel, Cadmium, Copper, Zinc, Chromium, Sea water, Oysters, Toxicity, Domestic wastes, Dilution, Pilot plants, Tertiary treatment, Absorption.
Identifiers: Phaeodactylum tricornutum, Sea food farming.

Guidelines are developed to define suitable sources of effluents for aquaculture. In scale-model treatment-aquaculture systems, effluent metal concentrations had little influence on algal (Phaeodactylum tricornutum) abundance. Permissible levels in effluents of copper, cadmium, nickel, chromium, lead, and zinc which might inhibit algal growth or cause morphological changes were determined. High density cell cultures suppressed toxicity. Toxic levels of metals decreased culture stability and its ability to recover from production slumps. No acute toxicity to oysters was observed. All elements were accumulated by phytoplankton; absorption of lead varied with effluent concentration, but the order of magnitude of metal accumulation was stable for the others (in decreasing order: zinc, copper, cadmium, nickel, chromium). An increase in metal concentration in seawater/effluent media increased the metal concentration in oyster tissues. Chromium, nickel, and cadmium had lower affinities; lead concentration rose abruptly; while cadmium showed detectable accumulation but appeared to saturate at the highest level. The amount of copper, cadmium, nickel, and chromium uptake decreased with increasing concentration. Values are given for each metal concentration permissible in effluents based on algal acute toxicity, shellfish acute toxicity, human acute and chronic toxicities, and pollution alert levels. (See also W76-10986) (Buchanan-Davidson--Wisconsin).
W76-10994

INTEGRATED SYSTEMS OF MOLLUSK CULTURE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10996

VIRUS SURVIVAL PATTERNS IN A TERTIARY SEWAGE TREATMENT-AQUACULTURE MODEL SYSTEM,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. M. Vaughn, and J. H. Ruther.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 324-346. 5 fig., 1 tab., 19 ref. NSF RANN GI-32140

Descriptors: *Viability, *Viruses, *Tertiary treatment, *Sewage treatment, *Aquiculture, Laboratory tests, Sewage effluents, Hydrogen ion concentration, Mollusks, Algae, Sea water.

The presence of pathogenic human viruses in sewage effluent could pose a threat to social and legal acceptance of aquaculture system products as viruses could be accumulated by filter-feeding mollusks. Virus survival under simulated conditions of a tertiary sewage treatment aquaculture system was studied. Algae (Skeletonema costatum, Chaetoceros simplex, and Cylindrothecia closterium) and MS-2 phage or poliovirus type II were used. Contact between pure algal cultures and viruses produced no significant removal of virus from water by non-specific adsorption. The survival time was found to be longer in a pure culture of growing algae (C. closterium) despite environmental conditions which are usually believed to be antiviral in nature, such as sea water, high pH, etc. Virus survival was further enhanced with increasing concentrations of sewage effluent in sewage-seawater mixtures. Viral progress through aquaculture systems was not impeded in the algal ponds; thus mollusks would be exposed, perhaps contaminating the entire system. The best and perhaps the only solution to the potential virus problem may be the effective removal or deactivation of the virus prior to using the effluent. A variety of in-line virus removal processes are being studied. (See also W76-10986) (Buchanan-Davidson--Wisconsin)
W76-10999

ANIMAL WASTE MANAGEMENT CONFERENCE.
Iowa State Univ., Ames.
Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 101 p.

Descriptors: *Farm wastes, *Management, *Livestock, *Confinement pens, *Waste treatment, *Waste storage, *Waste disposal, *Feed lots, Economics, Legal aspects, Lagoons, Runoff.

This conference was held in order to give an overview of animal waste management alternatives as they are practiced nationally, regionally, and by state. Animal waste characteristics, waste treatment facilities, waste disposal methods, and open lots vs housed confinement come under close scrutiny. Legal and regulatory aspects of confinement are discussed. Activities of the Environmental Protection Agency, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Iowa Water Pollution Control Commission are discussed as well. (See W76-11033 thru W76-11046) (Merryman-East Central)
W76-11032

ANIMAL WASTE MANAGEMENT--COMMENTS ON THE NATIONAL SITUATION,
Agricultural Research Service, Peoria, Ill. Agricultural and Natural Resources Div.
K. R. Majors.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971. 7 p, 2 tab.

Descriptors: *Farm wastes, *Management, *Livestock, Feed lots, Confinement pens, Economics, Legal aspects, Technology, Waste treatment.

The character and magnitude of the problem of animal waste management, the impact of waste management and requirements of pollution control now mandatory for livestock producers, and the waste-management phase of livestock production are discussed. Agriculture ranks high as a generator of wastes--from both animal and crop production--but agriculture is unique in that it makes use of biological procedures almost entirely. The total animal waste figure is around two billion tons per year, or 55 million tons per day. Confinement housing systems for all animal production, with quite different waste management systems than those for feedlots, must handle the same amount of waste per animal. Waste management and pollution control have become a concern in the livestock marketing system as well. Discussed briefly are various basic aspects of waste management including: technological requirements; regulatory requirements; economic factors; and social, political, legal, and related factors. Additional funds, expansion of activities, shifts in program emphasis, legislation for waste control, and cost sharing and broadening of provisions for financial assistance for feedlot operators are the key items desired by governmental agencies in order to make their programs more effective. (See also W76-11032) (Cartmell-East Central)
W76-11033

THE STATE AND REGIONAL SITUATION,
Iowa Agricultural and Home Economics Experiment Station, Ames.
S. W. Melvin.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 9 p. 6 tab.

Descriptors: *Feed lots, *Confinement pens, *Farm wastes, *Livestock, *Management, Water pollution, Odor, Fishkill, Runoff, *Central U.S., Waste treatment.

The Midwest is now and will continue to be a great livestock-producing area. Waste management problems have resulted from increased densities of animals in confinement. The water pollution hazard of many animal production units has been recognized. Regulations for control of this problem presently exist in most of the midwestern states. Odor is still a problem to many producers. The technology of animal waste management must develop rapidly to solve many of the producers' problems. (See also W76-11032) (Cartmell-East Central)
W76-11034

AEROBIC WASTE TREATMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
D. L. Day.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971. 14 p. 3 fig, 6 tab, 4 ref.

Descriptors: *Aerobic treatment, *Farm wastes, *Waste treatment, Aerobic conditions, *Oxidation lagoons, *Aerated lagoons, Municipal wastes, Design, Odor, Costs, Livestock, Aerobic bacteria.

Several forms of aerobic treatment relative to use in municipal waste treatment plants and adaptations for treatment of livestock metabolic wastes are discussed. Aerobic lagoons may be divided into two classifications, dependent upon the method of aeration: oxidation ponds (naturally aerated lagoons) and aerated lagoons (mechanically aerated lagoons). An oxidation pond is usually a shallow basin 3 to 5 feet deep for the purpose of treating sewage under climatic conditions (warmth, light, and wind) that promote the introduction of atmospheric oxygen and that favor the growth of algae to produce oxygen. An aerated lagoon is one that has a device that beats or blows air into the water with a portion of the oxygen being dissolved. The oxidation ditch is a modified form of the activated-sludge process. Aerobic bacteria use the organic matter in the waste as food for their metabolic processes, thus reducing the biologically degradable organics to stable material, with carbon dioxide and water as the major by-products. Design recommendations for in-the-building oxidation ditches are given. Some form of aerobic treatment is likely to be used in livestock waste management schemes because of the low level of odors associated with this method of treatment. (See also W76-11032) (Cartmell-East Central)
W76-11035

SYSTEM COMPONENTS TO SEPARATE SOLIDS AND LIQUIDS,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
G. L. Pratt.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 7 p. 3 fig.

Descriptors: *Solid wastes, *Liquid wastes, *Separation techniques, *Waste treatment, Feed lots, Livestock, Settling, Filtration, Centrifugation, Slurries, *Farm wastes.
Identifiers: Gravity flow.

The separation of solids from the liquid component of livestock manure adapts to many waste treatment and handling systems. Separation of these components is being introduced into systems where the material is separated prior to treatment as well as after the combined materials have undergone a treatment process. Two general methods are being used to accomplish the separation of manure components. These are settling and mechanical separation. In all devices that are used to settle solid materials from the liquid component of livestock waste, the velocity of flow of the liquid solid slurry is retarded to the point where sedimentation can occur. Concrete tanks and earth dugouts are being used for settling containers for the manure slurries. For runoff from feedlots, segregating the solid material from the liquids may be accomplished by settling channels. Mechanical separation includes filtration and centrifugation. Filtration of the combination solid liquid waste from livestock systems can often be designed to provide satisfactory installations. Advantages of the centrifuge are given. Gravity flow of liquids away from the solid manure is being investigated. Equipment improvements must be perfected before the system can be recommended. (See also W76-11032) (Cartmell-East Central)
W76-11036

SWINE MANURE COLLECTION AND REMOVAL SYSTEMS,
Iowa Agricultural and Home Economics Experiment Station, Ames.
L. D. Van Fossen.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 6 p.

Descriptors: *Hogs, *Farm wastes, Confinement pens, Labor, Hydraulic transportation, Lagoons, Cleaning, *Waste treatment, Cleaning.
Identifiers: Stockpiling, Slotted pits, Flushing tanks.

Collection and removal systems for swine manure are described. Topics considered are: (1) hand cleaning, (2) mechanical cleaning, (3) pumps and stockpiling, (4) moving manure with a hydraulic head, (5) manure storage in the building, and (6) hydraulically handling manure. (See also W76-11032) (Cartmell-East Central)
W76-11037

NATURE AND BEHAVIOR OF MANURE,
North Dakota State Univ., Fargo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-11038

DESIGN CONSIDERATIONS IN FEEDLOT RUNOFF CONTROL,
Iowa Agricultural and Home Economics Experiment Station, Ames.
S. W. Melvin.
In: Animal Waste Management Conference, Iowa State University, October 13-15, 1971, 5 p.

Descriptors: *Feed lots, *Runoff, *Control, *Design, *Farm wastes, Chemical characteristics, Waste disposal, Waste treatment, Iowa.

This outline of feedlot runoff pollution and control defines the following: (1) feedlot runoff, (2) problems caused by feedlot runoff, (3) factors affecting feedlot runoff quality, and (4) component design of runoff control facilities. Suggestions for minimizing feedlot complaints are listed. (See also W76-11032) (Cartmell-East Central)
W76-11039

WASTE MANAGEMENT SYSTEMS FOR ROOFED BEEF CONFINEMENT FACILITIES,
Minnesbta Univ., St. Paul. Dept. of Agricultural Engineering.
J. A. Moore.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971. 6 p. 1 fig, 1 tab.

Descriptors: *Farm wastes, *Management, *Cattle, *Confinement pens, Performance, Oxidation lagoons, Liquid wastes, Pollution abatement, Waste treatment.
Identifiers: *Roofed beef confinement, *Waste management systems.

The major objectives considered when discussing a waste management system are pollution control, saving of labor, and an increase in animal productivity. The system may be divided into four components: collection, storage, treatment, utilization and/or disposal. In the discussion of roofed beef confinement, the facilities are divided into three categories: (1) environmental conditions (cold and warm units), (2) floor type (solid or slatted), and (3) moisture content of the waste (less than 1% to over 50% total solids). The right types of confinement facilities discussed are dry solid cold, dry solid warm, dry slatted cold, dry slatted warm, liquid solid cold, liquid slatted cold, liquid solid warm, and liquid slatted warm. Climate has a direct relationship upon the selection of these systems. By listing objectives, properties of waste material, and the design of the system, an optimum design can be obtained. (See also W76-11032) (Cameron-East Central)
W76-11040

SWINE SYSTEMS FOR IOWA AND NORTH CENTRAL STATES,
Iowa Agricultural and Home Economics Experiment Station, Ames.
L. D. Van Fossen.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 3 p.

Descriptors: *Hogs, *Farm wastes, *Management, *Iowa, *Environmental control, Confinement pens, Waste storage, Waste disposal, *Central U. S., Waste treatment.

Before building a swine facility, the producer must compare the features of the alternate systems in order to select the ones most appropriate for his needs. The goal to develop successful swine facilities is to minimize extreme and uncomfortable environmental stress conditions that adversely affect pig performance, utilize natural pig habits to properly select the building features and operate the facility, and provide convenience for the swine producer. Items to be considered are: (1) level of environmental control, (2) environmental modifying systems, (3) manure collection and removal systems, (4) manure disposal systems, (5) feeding systems, (6) pen size, (7) animal and man access, (8) arrangement, (9) pen partitions, (10) building location, and (11) operating the system. (See also W76-11032) (Cartmell-East Central)
W76-11041

WASTE APPLICATION TO SOILS,
Iowa State Univ., Ames.
J. K. Koelliker.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 8 p.

Descriptors: *Farm wastes, *Application methods, *Soils, Fertilizers, Economics, Waste disposal, Water pollution, Nutrients, Bacteria, Odor, Soil contamination, Groundwater, Denitrification, Application rates.
Identifiers: Land spreading, Surface water pollution.

Manure disposal can cause air, water, or soil pollution. Air pollution may be caused by odors emitted during spreading or from manure left uncovered following spreading. Air pollution during spreading can be avoided by spreading only when meteorological conditions are favorable for good air mixing and when the wind will dissipate odors

into an unpopulated area. Direct injection of liquid manure can eliminate nearly all odor during spreading. Surface water pollution is caused by inadequate incorporation of manure into the soil surface. Consequently, runoff from this soil may result in excessive organic load, excessive nutrients, and possible bacterial contamination of streams and lakes. Spreading on steep slopes, frozen or snowcovered ground, or flood plains should be avoided unless incorporation can be done immediately. Groundwater pollution may result from excess nitrogen and from bacterial contamination from farm wastes. Soil contamination may also result from manure disposal. Heavy manure applications can result in anaerobic conditions caused by rapid decomposition and excess soil water. Design criteria and recommendations are given for combatting these pollution problems. (See also W76-11032) (Cartmell-East Central)
W76-11042

ECONOMIC CONSIDERATIONS INVOLVED IN SELECTING TYPES OF CONFINEMENT AND WASTE DISPOSAL SYSTEMS FOR SWINE AND BEEF,
Iowa State Univ., Ames.
E. G. Stoneberg.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 5 p.

Descriptors: *Economics, Confinement pens, *Waste disposal, *Hogs, *Cattle, Costs, *Farm wastes, Water quality standards, Waste treatment.
Identifiers: *Beef, Environmental standards.

Some of the critical factors which influence the selection of types of confinement and waste systems are presented. The use of confinement systems in beef or swine production substantially increases the capital investment within the enterprise. Because of the high capital requirements of confinement systems, consideration must be given to the potential advantages and disadvantages of this investment and to some of the characteristics of the investment. Although there are wide variations in the investment per animal unit capacity in confinement systems, the average investment per head of annual capacity in a cattle confinement system is normally in the range of $75 to $150. This does not normally include feed storage or processing facilities and may not include feed distribution equipment. The annual ownership costs of a confinement facility will probably fall in the range of 13 to 20 percent of the original cost. Any type of confinement system for pork or beef production requires some provision for animal waste disposal. Environmental standards for disposal of animal wastes may change the structure of the swine and beef industries if these standards are very severe. (See also W76-11032) (Cartmell-East Central)
W76-11043

LEGAL ASPECTS OF LIVESTOCK PRODUCTION AND WASTE MANAGEMENT,
Iowa State Univ., Ames.
N. E. Harl.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 11 p.

Descriptors: *Legal aspects, *Livestock, *Farm wastes, *Management, Economics, Costs, Ethics, Negligence, Trespass, Waste treatment.
Identifiers: Nuisance laws, Registration.

Pollution is an economic problem. Three basic approaches are possible to shift the external costs back onto the pollutor. Develop an ethic of environmental preservation; create appropriate economic incentives or disincentives to achieve a desired behavior pattern; or impose legal regulations or legal sanctions to circumscribe undesirable behavior patterns. The idea of an environmental ethic is unlikely to be sufficiently effective to improve environmental quality at an acceptable pace. Most ethical standards relied upon by society have come to be backed by the force of law. The concept of taxes or charges on those polluting to (1) encourage substitute production methods that are less harmful to the environment, (2) increase the cost to consumers of products having an adverse effect upon the environment with the result that consumers tend to consume more of the less harmful products, and (3) generate revenues to fund public efforts to improve environmental quality holds considerable economic appeal, although relatively little use has been made of this approach in the past. It has become clear that the rights inherent in land ownership do not sanction or protect activities contributing to environmental pollution. Livestock producers must recognize that fact or face serious legal difficulty either through private litigation, public response to violation of environmental quality standards, or both. (See also W76-11032) (Cartmell-East Central)
W76-11044

EPA'S ROLE IN THE ANIMAL WASTE PROBLEM: PANEL DISCUSSION,
Agricultural Stabilization and Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11045

SOIL CONSERVATION SERVICE PROGRAM IN ANIMAL WASTE MANAGEMENT,
Soil Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11046

LARGE COMMERCIAL FEEDLOTS - HOW WASTES ARE HANDLED IN THE WEST,
Agricultural Research Service, Lincoln, Neb.
C. B. Gilbertson.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb. 1-5, 1971, p. 270-279. 2 fig.

Descriptors: *Feed lots, *Nebraska, *Design, Performance, Runoff, *Farm wastes, Waste treatment, Waste disposal.
Identifiers: *Waste handling, *Runoff control.

Research is underway for determining design factors for construction, installation and management of runoff control facilities on outdoor feedlots. There are three requirements for a functional runoff control facility: (1) a debris basin, (2) a holding pond, and (3) disposal area. Two separate management designs are available for installation. They are the 'batch' system and the 'continuous flow' system. Both systems must be designed for removal of settleable solids from the runoff. Many factors must be blended in the design of a feasible feedlot operation which will yield good animal performance and, at the same time, control all wastes, including surface runoff, groundwater contamination and nuisances such as odors, dust, and flies. Several steps are listed for designing and constructing a runoff control facility for a beef feedlot. Assistance for design, layout and construction may be obtained from local health authorities, Soil Conservation Service, Extension Agricultural Engineers, and practicing consulting engineers. (Cameron-East Central)
W76-11048

CONTROLLING BARNYARD RUNOFF,
Soil Conservation Service, Madison, Wis.
J. Densmore.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb. 1-5, 1971, p. 211-214.

Descriptors: *Waste disposal, Wisconsin, Feed lots, Farm wastes, Runoff, Waste treatment, Water pollution control.
Identifiers: *Runoff control, Barnyards.

A concerted effort has been made by the Soil Conservation Service, at the request of farmers, to provide technical assistance in planning and implementing needed measures to control feedlot and barnyard runoff. In providing a barnyard runoff control system, attention should be given to three basic steps: (1) making use of structures and practices that will intercept and divert all surface runoff not originating on the yard, (2) reshaping the lot to provide good surface drainage, and (3) collecting, conveying, storing and finally safely disposing of runoff from the livestock yard itself. To meet the problem in any feedlot or barnyard, one or perhaps all three of these steps may be needed. Temporary storage of barnyard runoff can be provided in a settling pond or basin and in a retention pond. Not only are good planning and construction essential for the success of farm animal waste disposal systems, but increasing attention will have to be given to maintenance and management. (Cameron-East Central)
W76-11049

FARM ANIMAL WASTE MANAGEMENT: WHAT OUR MILK MARKET REQUIRES,
Wisconsin State Dept. of Agriculture, Madison. Food and Standards Div.
N. E. Kirschbaum.
In: Proceedings of Conferences on Farm Animal Wastes, Nitrates and Phosphates in Rural Wisconsin Ecosystems, Madison, Green Bay, and Eau Claire, Wisconsin, Feb. 1-5, 1971, p. 208-210.

Descriptors: *Milk, *Waste disposal, *Dairy industry, *Management, Wisconsin, *Farm wastes, Waste treatment, Regulation.
Identifiers: Waste management.

A rough estimate of the manure produced daily by dairy herds in Wisconsin is 200,000 tons. In the past, major efforts have been made to encourage daily removal and field spreading of animal wastes or manure. In General Order No. 124, certain provisions for the handling of dairy farm animal waste and human waste, as they would affect the production of milk, were established. Specific requirements found in the statutes are set forth. These provisions are concerned primarily with the cleanliness of the cows, the breeding of flies, and the pollution of water used for drinking or for cleaning equipment. The daily removal and spreading of manure, which was previously recommended, is now being discouraged. Dairy farmers are now confronted with questions of lagoons, liquid manure handling operations, stacking of manure, and similar issues. All of these methods are unique and present problems with handling, odors, fly control, and possible water pollution. More research is needed to make certain that practical solutions are found for problems accompanying methods of animal waste storage and disposal. (Cameron-East Central)
W76-11050

SEEPAGE LOSS FROM HOLDING PONDS,
Soil Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 5B.
W76-11051

HOW TO PLAN AND MANAGE A LAGOON,
B. Eftink.
Successful Farming, Vol. 71, No. 8, p. H4, June-July, 1973. 1 fig.

Descriptors: *Lagoons, *Planning, *Management, *Waste disposal, *Farm wastes, Hogs, Sludge, Aerated lagoons, Anaerobic conditions, Livestock, Waste treatment.

A lagoon must be built downwind from houses, away from water wells, yet close to the animals. The lagoon should also be large enough to contain the sludge from the animals. Once the lagoon starts working, it's better to make frequent, small loadings instead of uneven, large loadings which

cause bacteria fluctuations and poor decomposition. (BallardoEast Central)
W76-11052

BIODEGRADING POULTRY EXCRETA WITH HOUSE FLY LARVAE: THE CONCEPT AND EQUIPMENT,
Agricultural Research Service, Washington, D. C. Entomology Research Div.
N. O. Morgan, C. C. Calvert, and R. D. Martin.
ARS 33-136, United States Department of Agriculture, Agricultural Research Service, February, 1970, 3 p. 1 fig, 2 ref.

Descriptors: Poultry, *Farm wastes, *Biodegradation, Fertilizers, Organic wastes, *Waste treatment, Waste disposal, Recycling, Equipment.
Identifiers: *House fly larvae, White leghorns, *Poultry excreta.

The excretion of one White Leghorn laying hen amounts to 0.25-0.40 pound per day. In biodegradation experiments in Beltsville, Maryland, larvae of the house fly are being used to process the raw excreta of hens to produce a fertilizer or soil conditioner and a feed supplement. These experiments involve allowing the fly eggs to hatch on the poultry feces and the larvae develop. The larvae then aerate the medium by their tunneling which produces a fertilizer or soil conditioner and a feed supplement. (Ballard-East Central)
W76-11053

LYSIMETER STUDIES WITH LONG TERM APPLICATION OF SWINE LAGOON EFFLUENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W76-11055

POLLUTION ABATEMENT SYSTEMS FOR FARM ANIMAL WASTES IN SOUTHEAST MICHIGAN,
Soil Conservation Service, Ann Arbor, Mich.
B. E. Boesch, and D. F. Kesselring.
Presented at the 1973 Annual Meeting, American Society of Agricultural Engineers, University of Kentucky, Lexington, June 17-20, 1973, Paper No. 73-414, 13 p, 2 ref.

Descriptors: *Farm wastes, *Michigan, *Pollution abatement, *Waste treatment, *Waste disposal, *Waste storage, *Design, Equipment, Costs, Livestock, Feed lots, Lagoons, Irrigation, Construction costs.

Seventy-nine pollution abatement systems for farm wastes were installed in southeast Michigan during 1970 to 1972. The systems varied greatly in size, but they can be categorized into farm functions: diversion, collection, storage, and disposal. The systems used to perform these functions are discussed. Included in the discussion are: liquid manure tanks, holding ponds, semiliquid manure storage units, solid storage units, earthen holding pits, conventional manure-handling equipment, tanker wagons, and spray distribution systems. Actual design, construction, costs, and guidelines for these waste management systems are given. (Frantz-East Central)
W76-11057

PERFORMANCE OF FEEDLOT RUNOFF CONTROL FACILITIES IN KANSAS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
J. K. Koelliker, H. L. Manges, and R. I. Lipper.
Presented at 1974 Annual Meeting, American Society of Agricultural Engineers, Oklahoma State University, Stillwater, June 23-26, 1974, Paper No. 74-4012, 17 p, 2 fig, 3 tab, 9 ref.

Descriptors: *Feed lots, *Runoff, *Control, *Kansas, *Model studies, Performance, Design, Disposal, Irrigation, Waste treatment, Watershed management, *Farm wastes, Waste disposal.

A continuous watershed model utilizing daily inputs has been developed to evaluate expected performance for feedlot runoff control facilities for Kansas conditions. In Kansas, runoff control structures sized to contain the entire volume of the 10-year and 25-year 24-hour precipitation from the feedlot and dispose of 10 percent of the design volume per disposal day would control from 91.3 to 99.4 and 93.0 to 100.0 percent, respectively, of all runoff from an unsurfaced feedlot from east to west across the state. About one-third of the average precipitation in Kansas is expected to run off an unsurfaced feedlot while about forty-four percent is expected to run off a surface lot. Based upon results of this watershed model, evaporation pond sizes to provide as good or better control for Kansas than land disposal systems would be 6 feet deep for a surface area 120 percent of the minimum surface area and 4 feet deep for a surface area 150 percent of the minimum surface area. Use of this watershed model allows prior evaluation of various alternative systems for both the level of pollution control expected as well as management feasibility. (Cartmell-East Central)
W76-11058

A SUMMARY OF STATE REGULATIONS PERTAINING TO ANIMAL WASTE MANAGEMENT IN THE NORTH CENTRAL REGION OF THE UNITED STATES,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11060

THE IMPACT ON DAIRY FARM ORGANIZATION OF ALTERNATIVE MANURE DISPOSAL SYSTEMS. A METHOD OF ASSESSING THE COST OF ENVIRONMENTAL REGULATION,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
M. Ashraf, R. L. Christensen, and G. E. Frick.
Research Bulletin Number 608, University of Massachusetts Agricultural Experiment Station, Amherst, Massachusetts, May 1974. 40 p, 24 tab, 17 ref.

Descriptors: *Dairy industry, *Costs, *Waste disposal, *Regulation, Water pollution, Nutrients, Fertilizers, Farm wastes, Waste treatment, Economic impact, Estimated costs, Alternative planning.
Identifiers: *Linear models, Land disposal, Stacking systems.

The economic impact is given for controlled use of commercial fertilizers and of alternative waste disposal systems on 25 dairy farms with small, medium, and large herd sizes from the 3 geographical dairy regions of Massachusetts. Also evaluated are alternative manure disposal systems and farm resource adjustments minimizing the cost of meeting manure disposal constraints on individual dairies. Stacking and liquid pollution control systems required additional capital expenditure of 2 to 3 times and 3 to 5 times respectively, when compared to daily spreading systems. The liquid systems caused greater reductions in farm income compared to stacking systems, with the opportunity cost larger on free stall dairies than on stanchion dairies. Manure disposal may be improved by avoiding confinement systems and by acquiring additional acreage for forage production. The inclusion of plowing operations with the stacking and liquid systems yielded about twice and one-third greater cost opportunity than systems not requiring immediate plowing. On small farms, disposal in conjunction with plowing would be preferred because the added value of nutrients exceeded the combined marginal cost of labor and plowing. Results indicated a trade-off relationship between dairy farm income and enhancement of water quality. Income levels of the dairy operations could be restored to previous levels by acquiring about 50 acres of cropland and seasonal labor of 15 hours per week on 100 cow and 50 cow farms and 40 hours per week on 212 cow farms. (Battles-East Central)
W76-11061

RECYCLING GROUND WATER IN WAUSHARA COUNTY, WISCONSIN: RESOURCE MANAGEMENT FOR COLD-WATER FISH HATCHERIES,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 4B.
W76-11082

5E. Ultimate Disposal Of Wastes

RECYCLING OF LIQUID DIGESTED SEWAGE SLUDGE ON DREDGED RIVER SAND,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W76-10501

EPA'S NEW FEEDLOT DISPOSAL PLAN,
For primary bibliographic entry see Field 5D.
W76-10532

DISPOSAL OF CATTLE FEEDLOT WASTE IN AN ANAEROBIC LAGOON ON THE ORGANIC SOILS OF SOUTH FLORIDA--PRELIMINARY RESULTS,
Agricultural Research and Education Center Belle Glade, Fla.
F. M. Pate, B. G. Volk, T. W. Casselman, and J. R. Crockett.
Proceedings, Soil and Crop Science Society of Florida, Vol. 33, p. 224-227, 1974. 4 fig, 2 tab, 15 ref.

Descriptors: *Feed lots, *Florida, Lagoons, *Waste disposal, Chemical properties, Groundwater, Water pollution, Farm wastes, Anaerobic conditions, Soils, Organic soils, Waste treatment.
Identifiers: *Anaerobic lagoons.

A study was conducted to determine the effectiveness of an anaerobic lagoon for holding beef feedlot wastes on the organic soils of south Florida. A series of test wells were drilled 7.6, 30.5, and 61.0 m from the lagoon to monitor changes in groundwater quality. Initial lagoon and groundwater levels of NH3-N, NO3-N, dissolved PO4-P, chemical oxygen demand, and K were 2.0, 0.02, 0.04, 225, and 15 mg/liter, respectively. The highest levels of NH3-N, NO3-N, dissolved PO4-P, chemical oxygen demand and K observed in lagoon water were 125, 0.7, 36, 4000, and 280 mg/liter, respectively. These levels occurred when manure disposal was stopped, 5 months after disposal began. The chemicals monitored rapidly diminished after manure disposal into the lagoon stopped. The only observed increase in groundwater levels of these chemicals was in one of 6 wells 7.6 m from the lagoon. From these results, it was deducted that a moderate sized waste disposal lagoon on the organic soil region of south Florida will not immediately contaminate the surrounding groundwater, even though there was active water movement to and from the lagoon. (Merryman-East Central)
W76-10540

AN ECONOMIC APPRAISAL OF ALTERNATIVE DAIRY WASTE MANAGEMENT SYSTEMS DESIGNED FOR POLLUTION CONTROL,
Economic Research Service, East Lansing, Mich. Farm Production Economics Div.
For primary bibliographic entry see Field 5D.
W76-10547

QUALITY VARIATION OF FEEDLOT RUNOFF IN STORAGE,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5B.
W76-10549

WATER QUALITY AND ECONOMIC CRITERIA FOR RURAL WASTEWATER AND WATER SUPPLY SYSTEMS,
Duke Univ., Durham, N. C. School of Forestry.
For primary bibliographic entry see Field 5D.
W76-10583

CHEMICAL AND MICROBIOLOGICAL CHANGES IN POULTRY LITTER APPLIED TO SOIL AS INFLUENCED BY THE TIME AND METHOD OF APPLICATION,
Georgia Univ., Athens. Dept. of Agronomy.
A. M. Rao.
PhD Dissertation, 1973, 90 p. 22 fig, 12 tab, 75 ref.

Descriptors: *Poultry, *Litter, *Chemical properties, *Microorganisms, *Waste disposal, *Application rates, Soils, Ammonia, Coliforms, Farm wastes, Degradation(Decomposition).
Identifiers: *Land application, *Application method.

An investigation was conducted to determine the number and types of microorganisms during decomposition of poultry litter in soil and the effect of interval and method of poultry litter application on some soil properties with particular emphasis on possible contribution to surface and underground water pollution. The persistence and effect of ammonia concentration on coliform bacteria were also studied. These experiments were conducted both in the laboratory and in the field over a two-year-period. Laboratory studies were conducted mainly to obtain initial information for the field experiment. Separate experiments were conducted to determine (a) the effect of drying on N loss in fresh droppings, (b) the effect of rate, method and time of application of litter on nitrification, and (c) the changes in the microbial ecology of decomposing poultry droppings and litter upon incubation with and without soil. The field experiment was initiated to determine the effect of method and time of application of poultry manure on (a) soil NO3-N and other nutrients vertical distribution in the soil profile, and (b) the number and relative abundance of major groups of soil microflora including coliform bacteria. Results are given for both laboratory and field studies. It was felt that the combination of an N responding crop with litter application might provide a safer and more efficient disposal method than trying to reduce nitrates by frequent applications. The abundance and movement of soil microflora were increased by litter application, but coliforms were not greatly increased. Pollution by pathogens from poultry manure would more likely occur in surface runoff than in groundwater. (Cameron-East Central)
W76-10615

MANURE AND THE NITRATE PROBLEM,
Delaware Univ., Newark.
W. C. Liebhardt.
In: Lime and Fertilizer Conference, Delaware-Maryland Plant Food Association Proceedings, 1972, 2 p. 2 tab.

Descriptors: *Recycling, *Crop response, *Poultry, *Nitrates, Groundwater, Water pollution, Farm wastes, Waste disposal, Delaware, Solid wastes, Soils.
Identifiers: *Land disposal, *Application rates.

In Delaware approximately 140 million chickens are grown each year. The amount of waste these chickens produce is greater than the amount of solid waste produced by New York City. The waste is being recycled back to the soil at so great a rate that it is reducing the crop yield. Another problem is that with the sandy soil and high water table, nitrates may leach into the ground water supply. Public health standards set the limit for NO3-N at 10 ppm. In soil samples taken at a depth of 4 ft, the level found in the ground water usually exceeded this amount. Poultry manure is being added to the soil at rates of 10 to 100 tons per acre. Ten tons of manure contains approximately 254 pounds of N, 108 pounds of P2O5, and 185 pounds of K2O, plus secondary and micronutrients. The corn yield at this rate is about 55.6 bushels per acre. At 100 tons of manure per acre, the yield was about 14 bushels per acre, a substantial reduction. (Cannon-East Central)
W76-10616

DISPOSAL LAGOON.
Soil Conservation Service, Honolulu, Hawaii.
For primary bibliographic entry see Field 5D.
W76-10618

FEASIBILITY OF USING SEWAGE SLUDGE IN HIGHWAY EMBANKMENT CONSTRUCTION,
Gillette Co. Research Inst., Rockville, Md.
A. Kawam, L. M. Smith, J. Ross, H. G. Larew, and L. Rude.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-242 260, $4.50 in paper copy, $3.00 in microfiche. Federal Highway Administration, Report No. FHWA-RD-75-38, February, 1975, 44 p. 11 fig, 23 tab.

Descriptors: *Sewage sludge, *Lime, *Fly ash, *Calcium sulfate, *Sludge disposal, Soils, Construction materials, *Embankments, Highways, *Feasibility.
Identifiers: Sulfate waste, Waste utilization.

The possible use of sewage sludge combined with other by-products and wastes in constructing a highway embankment was investigated in the laboratory. The mixtures evaluated contained lime, fly ash, waste calcium sulfate, and up to 17% sewage sludge. The effect of fly ash source, lime type, and relative proportions of fly ash, lime, and waste calcium sulfate on the compressive strength of compacted specimens was measured. For over 75% of the formulations, the 28-day compressive strength was 50 psi greater than that of uncured specimens. In selected formulations, 30, 50, and 70% of the fly ash was replaced with two soils, one sandy and the other clayey. For all samples with the soil replacement, the 28-day compressive strength was at least 50 psi greater than that of uncured specimens. Volume change, durability, permeability, and leachability tests were performed on selected formulations. The mixes broke up considerably in the freeze-thaw and wet-dry tests. The permeability was of the order of 0.000006 cm/sec. The heavy metals in the sewage sludge, cadmium, chromium, mercury, and zinc, were retained in the mixture rather than entering the leachate in the permeability tests. The pH and calcium and sulfate ion concentrations in the leachate were increased by lime and gypsum. Small quantities of sewage sludge can be mixed with soil, lime, fly ash, and waste sulfate to produce a material suitable for use in highway embankments. The embankments should be so zoned during construction that the sewage sludge treated materials are at least 3 ft below any exposed surfaces, to prevent freeze-thaw or wet-dry breakup of the material. (Snyder-FIRL)
W76-10624

AEROSOL PRODUCTION FROM LAND APPLICATION OF WASTEWATER BY AGRICULTURAL IRRIGATION EQUIPMENT,
Brookhaven National Lab., Upton, N. Y.
For primary bibliographic entry see Field 5D.
W76-10625

MONITORING OF SUBSURFACE WASTE-DISPOSAL OPERATIONS: A GENERALIZED SYSTEMS APPROACH WITH EXAMPLES FROM CANADIAN CASE HISTORIES,
Windsor Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5D.
W76-10662

LAND DISPOSAL OF WASTES: POTENTIAL FOR GROUNDWATER POLLUTION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. A. Carnes, D. R. Brunner, R. E. Landreth, and M. H. Roulier.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 15-2-1 - 15-2-3. 12 ref.

Descriptors: *Landfills, *Waste disposal, *Groundwater, *Water quality, *Monitoring, Industrial wastes, Municipal wastes, Sanitary engineering, Subsurface waters, Water pollution, Flow.

The potential for groundwater contamination as a result of land disposal of municipal and industrial wastes is discussed. Studies have identified certain geographic regions which are more susceptible than others to groundwater contamination, and case histories of pollutants migrating into surface or groundwater are established. The placement of landfill activities over or near groundwater tables generally poses a definite threat to the water quality of the latter. A shortage of well-documented cases of water pollution resulting from poor land disposal practices appears to be primarily due to a lack of adequate surface and groundwater monitoring. Observation well monitoring systems do not appear to be the most effective means of tracing chemical pollutant flow paths or for determining groundwater chemical concentrations at any time or depth; rather, chemical analysis of core samples from the underlying earth material profile seems to be preferred since it permits a positive definition of any chemical constituent within the profile at any given location. (See also W76-10637) (Kreager-FIRL)
W76-10667

DUMPING SEWAGE SLUDGE IN THE OCEAN.
Environmental Science and Technology, Vol. 10, No. 6, p 530-531, June, 1976. 2 fig.

Descriptors: *Pollutant identification, *Sludge disposal, *Sewage sludge, *Atlantic Ocean, Organic matter, Decomposing organic matter, Water pollution sources, Water pollution effects, Waste dumps, Mixing.
Identifiers: *New York Bight, *Sewage sludge dumping.

Shortly after sewage sludge is dumped at the designated New York Bight site, there is very little evidence that the sludge had been dumped. Organic material-rich muds are detected, but they may be composed partly of dredged material (DM), or even material of natural origin, as well as sewage sludge. Most of this material is found in a topographic depression north and west of the sewage sludge dump site, at the head of the Hudson Shelf Valley. By December 1973, sewage sludge dumping (SSD) had become a very controversial issue, the response to which led to greater emphasis on SSD by the New York Bight Project (NYBP) of the Marine EcoSystems Analysis (MESA) Program. The study uses a ship to obtain data on salinity, temperature, turbidity, depth, dissolved oxygen (DO), and pH. Instruments on buoys also provide data on salinity, depth, temperature, and current velocity. The sewage sludge at the New York Bight Apex site consists of about 5% solids and 95% water. It is less dense than water and fractionates and is eddied about rather than sinking as a unit. Nevertheless, adverse effects include fin rot on some fish, exoskeleton erosion and gill clogging on crabs and lobsters, high coli counts, absence of adult surf clams near some dumping sites, decreased DO, high total organic

carbon(TOC) and heavy metals concentrations, and evidence of pathogens. The dumping area also receives contaminants from the Hudson River, air pollution fallout, and other waste disposal activities. Since there is no proof satisfactory to public health authorities of a hazard to human health, the National Oceanic and Atmospheric Administration (NOAA) suggests using the existing dump sites until ocean dumping be phased out in 1981. (Snyder-FIRL)
W76-10674

PESTICIDE INCINERATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. A. Carnes, and D. A. Oberacker.
News of Environmental Research in Cincinnati, April 15, 1976. 4 p, 3 fig, 11 ref.

Descriptors: *Pollutant identification, *Treatment facilities, *Organic pesticides, *Incineration, *Ultimate disposal, Smoke, Chlorinated hydrocarbon pesticides, Pilot plants, Efficiencies, Odor, Air pollution.

An experimental pilot-scale incineration system was designed and constructed to evaluate the effect of operating variables on the efficiency of pesticide destruction. Fifteen commercial formulations of nine pesticides representing the major classes of organic pesticides were individually tested. Stack gases from the incineration tests were analyzed for sulfur dioxide, oxides of nitrogen, carbon monoxide, carbon dioxide, methane, total hydrocarbons, and particulates. When organonitrogen and organophosphate pesticides were tested, analyses for cyanide and total pyrophosphates, pesticides can be destroyed. For each pesticide, a range of temperature retention times exists at which more than the necessary 99.99% is destroyed. Temperature and retention time in the combustion chamber were the two most important operating variables. Certain conventional solid, liquid, or sludge waste incinerators, with adequate retention time and operating temperature, could be used for pesticide incineration with an appropriate injection method. Emissions requiring control include particulates from solid formulations, phosphorus pentoxide from phosphorus-based pesticides, hydrogen chloride from chlorinated hydrocarbons, cyanide from nitrogen-containing organics, and sulfur dioxide. (Snyder-FIRL)
W76-10675

FLUID-MECHANICS ASPECTS IN THE DESIGN OF SEWAGE OUTFALLS INTO THE SEA (STROEMUNGSMECHANISCHE ENTWURFSASPEKTE FUER ABWASSEREINLEITUNGEN INS MEER),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
H. Kobus.
Wasserwirtschaft, Vol. 66, No. 5, p 148-155, 1976. 11 fig, 12 ref.

Descriptors: *Sewerage, *Outfall sewers, *Waste disposal, *Waste dilution, *Oceans, *Fluid mechanics, Mixing, Outlets.

Pollutants whose decay times are several days long can be disposed of with carefully designed ocean outfalls. The fluid mechanics of mixing and transport of the discharged wastes must be known to assess the effects in terms of water pollution. The outfall diffuser geometry and position can strongly influence the dilution process. Proper outlet structure design, therefore, allows the initial dilution to be optimized and, when density statification occurs, allows the sewage field to be submerged below the surface. (Snyder-FIRL)
W76-10678

A FEASIBILITY STUDY OF THE CONTROL OF POLLUTION FROM INDUSTRIAL WASTE WATERS DISCHARGED INTO THE LAGOON OF VENICE,
Bostock, Hill and Rigby. Birmingham, (England).
For primary bibliographic entry see Field 5D.
W76-10679

CITIES NEED SEWERLESS TOILETS,
Institute for Local Self-Reliance, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10680

DREDGED MATERIAL DISPOSAL--EFFECTS AND ALTERNATIVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
D. P. Booth, and R. T. Saucier.
Water Spectrum, Vol. 6, No. 3, p. 26-33, 1974. 8 p, 10 photo, 1 tab.

Descriptors: *Dredging, *Navigable waters, *Channels, Water quality, Environmental effects, Disposal, Navigation, Channeling, Channel improvement, Sediment control, Sediments, Sedimentation, Rivers and Harbors Act, Habitats.

Dredging to create and maintain navigable channels requires the removal of large quantities of sediment, which must be disposed of economically but with the least possible adverse environmental impact. The Rivers and Harbors Act of 1970 authorized research into the effects of such practices and consideration of possible alternatives. The Army Corps of Engineers Waterways Experiment Station (WES) has broken down its research into four general areas: aquatic disposal; productive uses; habitat development; and disposal operations. The purpose of the aquatic disposal research program is to determine under what conditions the magnitude of environmental impact of open water disposal will be sufficiently adverse to warrant expenditure of larger amounts of money for alternative disposal methods. The productive uses research program has assigned itself the task of inventorying and defining the geographical extent of potential disposal areas in relation to the location where dredged material will normally be generated. The habitat development research project explores the environmental impacts of land disposal. The disposal operations research program's most important objective is to operate confined land disposal sites and produce immediate results for the Corps. (Gagliardi-Florida)
W76-10724

HERE COME DE SLUDGE,
For primary bibliographic entry see Field 6E.
W76-10746

MARINE SANITATION DEVICE STANDARD,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10758

LONG-TERM STABILITY OF WASTE LIGNINS IN AQUATIC SYSTEMS. PART 2. STABILITY IN SALINE WATER,
Swedish Water and Air Pollution Research Laboratory, Stockholm, Sweden.
For primary bibliographic entry see Field 5B.
W76-10838

LAND APPLICATION OF SEWAGE SLUDGE, III. NITRATE ACCUMULATION AND WHEAT GROWTH RESULTING FROM ADDITION OF SEWAGE SLUDGE AND WOOD WASTES TO SOILS,
Colorado State Univ., Fort Collins.
B. R. Sabey, N. N. Agbim, and D. C. Markstrom.
Journal of Environmental Quality, Vol. 4, No. 3, p 388-393, 1975. 5 fig, 19 ref, 5 tab.

Descriptors: *Sewage sludge, *Wood wastes, *Bark, *Soil amendments, Wheat, Growth rates, Nitrates, Sludge disposal, Waste disposal, Leaching, Groundwater, Municipal wastes, Wastes, Water pollution sources, Soils, Soil treatment, Anaerobic digestion, Sludge treatment, Clay loam, Softwood.
Identifiers: Engelmann spruce(Picea engelmanni), *Spruce trees.

Mixtures of anaerobically digested municipal sewage sludge and Engelmann spruce wood and bark wastes were added to a Nunn clay loam to determine the effect on wheat growth in the greenhouse and on nitrate accumulation in the soil. When the mixtures contained more than 50% wood-bark, the nitrate content of the soil was extremely low, and wheat yields were low. Near maximum wheat growth resulted from several applications of mixtures consisting of 50% or less wood-bark residues. The results suggest that addition of up to 50% wood residues to sewage sludge may be useful for immobilizing part of the nitrates and preventing excessive leaching of nitrates into ground waters. (Buchanan-IPC)
W76-10841

POLLUTION CONTROL THROUGH UTILIZATION OF SPENT SULFITE LIQUORS FROM THE PULP INDUSTRY AS ORGANIC NITROGEN FERTILIZER (EIN BEITRAG ZUR UMWELTFREUNDLICHEN TECHNIK DURCH VERWERTUNG DER SULFITABLAUGEN DER ZELLSTOFFINDUSTRIE ALS ORGANISCHER STICKSTOFFDUENGER),
For primary bibliographic entry see Field 5D.
W76-10851

THE USE OF WASTE FIBERS AS ABSORPTION MATERIAL IN GRASS SILAGE,
Finnish Pulp and Paper Research Inst. Helsinki.
L. Soderhjelm, and M. Lampila.
Paperi ja Puu, Vol. 58, No. 2, p 41-46, February, 1976. 1 fig, 6 ref, 10 tab.

Descriptors: *Silage, *Pulp wastes, *Sludge, Water pollution sources, Wastes, Industrial wastes, Foreign research, Feeds, Absorption, Grasses, Sheep, Waste disposal, Landfills, Fuels, Digestion, Soil amendments, Fibers(Plant), Effluents.
Identifiers: Kraft mills, *Finland, Fiber recovery.

The Finnish pulp and paper industry annually generates about 180,000 tons of fibrous sludge of which only 60,000 tons are reused in paper or board production while 151,000 tons serve as landfill, 25,000 tons are incinerated as fuel, and 7,000 tons are sold and/or used for soil amendment. A study at the Finnish Pulp and Paper Research Institute (Helsinki) aimed at examining how these waste fibers absorb liquid in silos and at establishing their fodder value for domestic animals. Dried waste fiber from the effluent clarifier of a kraft pulp mill was mixed with grass (13% solids content) in proportions of 0, 10, 30, or 50% (based on dry weight) in connection with silage preparation. The amount of dry matter ensiled varied from 160 to 200 kg for each silo, and the feed mass was compressed under a pressure of about 1700 kg/sq m in each tower. Effluent was drained from the silos at fixed intervals, weighed, and analyzed. Under the experimental conditions used, the amounts of effluent were diminished by 4.58, 2.83, and 1.97 kg/kg of dry-solids fiber in silages containing 10, 30, or 50% of waste fiber, respectively, and the corresponding final dry matter contents of the silages were 18.2, 23.1, and 27.1%. The apparent organic matter digestibilities by sheep were 74.2, 76.1, and 77.6, and 79.7% for silages containing 0, 10, 30, or 50% fiber; the organic matter digestibility of the fiber, calculated as a difference from the 50% mixture, amounted to 83.5%. These results indicate that the waste fibers tested effectively reduce the loss of silo effluent and possess high feed value. (Brown-IPC)
W76-10863

ANIMAL WASTE MANAGEMENT CONFERENCE.
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11032

DESIGN CONSIDERATIONS IN FEEDLOT RUNOFF CONTROL,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5D.
W76-11039

SWINE SYSTEMS FOR IOWA AND NORTH CENTRAL STATES,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5D.
W76-11041

ECONOMIC CONSIDERATIONS INVOLVED IN SELECTING TYPES OF CONFINEMENT AND WASTE DISPOSAL SYSTEMS FOR SWINE AND BEEF,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11043

LARGE COMMERCIAL FEEDLOTS - HOW WASTES ARE HANDLED IN THE WEST,
Agricultural Research Service, Lincoln, Neb.
For primary bibliographic entry see Field 5D.
W76-11048

CONTROLLING BARNYARD RUNOFF,
Soil Conservation Service, Madison, Wis.
For primary bibliographic entry see Field 5D.
W76-11049

POLLUTION ABATEMENT SYSTEMS FOR FARM ANIMAL WASTES IN SOUTHEAST MICHIGAN,
Soil Conservation Service, Ann Arbor, Mich.
For primary bibliographic entry see Field 5D.
W76-11057

THE IMPACT ON DAIRY FARM ORGANIZATION OF ALTERNATIVE MANURE DISPOSAL SYSTEMS. A METHOD OF ASSESSING THE COST OF ENVIRONMENTAL REGULATION,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 5D.
W76-11061

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-11063

CONSTRUCTION AND TESTING OF TWO WASTE-INJECTION MONITOR WELLS IN NORTHWEST FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-11070

DISPERSION OF DYED SEA-WATER DISCHARGED FROM MOVING VESSELS IN COASTAL WATERS,
Dobrocky Seatech Ltd., Victoria (British Columbia).
For primary bibliographic entry see Field 5B.
W76-11086

5F. Water Treatment and Quality Alteration

ADVANCES IN INTERFACIAL PHENOMENA OF PARTICULATE/SOLUTION/GAS SYSTEMS; APPLICATIONS TO FLOTATION RESEARCH,
American Inst. of Chemical Engineers, N.Y.
For primary bibliographic entry see Field 5D.
W76-10627

ION AND PRECIPITATE FLOTATION OF METAL IONS FROM SOLUTION,
Pennsylvania State Univ., University Park. Mineral Processing Section.
For primary bibliographic entry see Field 5D.
W76-10630

WATER PROGRAMS SECONDARY TREATMENT INFORMATION,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10770

DOMESTIC WASTEWATER DISINFECTION, SECONDARY TREATMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10771

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10878

PROCESS OF WATER TREATMENT,
Water Technology Service, Inc., Cleveland, Ohio. (Assignee).
H. S. Aber, D. D. Riggs, and J. Lamantia.
U. S. Patent No. 3,954,589, 4 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 238, May 4, 1976.

Descriptors: *Patents, *Water treatment, *Water softening, *Hardness(Water), *Scaling, Water purification, Demineralization, Electric fields, Equipment.

The object of the invention is to provide an apparatus for treating liquid to eliminate hardness effects, to prevent scale and mineral formation in liquid streams and to provide an efficient long lasting excitation power source. The apparatus has an enlarged fitting adapted for coupling in a flow line. An insulated screen is supported in the fitting with an electric potential applied between the screen and the fitting. A cleaning device having sharp edges is positioned in the fitting to clean mineral and other deposits from the screen. (Sinha-OEIS)
W76-10971

FILTRATION AND BACKWASHING APPARATUS FOR USE WITH A WATER FILTRATION SYSTEM,
Hydrotechnic Corp., New York. (Assignee).
R. Nebolsine.
U. S. Patent No. 3,954,620, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 946, No 1, p 248, May 4, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality, *Filtration, Separation techniques, Filters, Equipment, Cleaning, *Waste water treatment.
Identifiers: *Backwashing apparatus.

A filtration and backwashing apparatus, for use with a water filtration system of the type having a filter bed, passes fluids through the entire cross-sectional area of a filter media bed at an even and uniform rate. The apparatus includes two plenum chambers, one being formed between a slotted plate supporting the filter media and the top of the structural deck. The second or lower chamber is formed below the structural fluid-tight deck. Nozzles connect the two plenum chambers and fluid is introduced and passed into either the upper or lower plenum chamber. For backwashing purposes fluid flow pipes with discharge orifices uniformly spaced under the structural deck introduce fluid into the lower plenum chamber and subsequently through the nozzles into the upper plenum chamber. (Sinha-OEIS)
W76-10977

SAFE DRINKING WATER ACT - IMPLICATIONS FOR GROUND WATER QUALITY PROTECTION,
California State Water Resources Control Board, Sacramento.
A. L. Franks.
In: Proceedings, Tenth Biennial Conference on Ground Water, September 11-12, 1975. Ventura, California, p 171-174.

Descriptors: *Legislation, Water treatment, Surface waters, Groundwater, Wells, Potable water, Water supply, Legal aspects, Water quality control, Regulation, Injection wells.
Identifiers: *Safe Drinking Water Act, *Drinking water legislation, Public water supplies, Underground water sources, Underground injection systems, Enforcement of regulations, Secondary drinking water regulation.

The Safe Drinking Water Act provides a national primary drinking water regulation to protect health to the extent feasible using technology, treatment techniques and other means generally available on the date of enactment (December 17, 1974). Part A defines terms. Part B indicates congressional intent to provide for proper treatment of public water supplies. Part C provides for protection of underground sources of drinking water from underground injection systems. Section 1422 delegates primary enforcement responsibility to the state. The Environmental Protection Agency can enforce compliance under Section 1423 if the state fails to do so. The remainder of the Act deals with interim regulations for underground injection, emergency powers, availability of supply, water treatment chemicals, research, technical assistance, training, grants for state programs, special studies, demonstration grants, guaranteed loans, establishment of a national drinking water advisory council and judicial review. Secondary drinking water regulations are to be published 270 days after enactment with regulations being promulgated 90 days thereafter. These interim regulations are to take effect in December, 1976. (Heiss-NWWA)
W76-11064

5G. Water Quality Control

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
For primary bibliographic entry see Field 10C.
W76-10502

ENVIRONMENTAL CONTROL IN ANIMAL SHELTERS USING POWER PLANT THERMAL EFFLUENTS,
Oak Ridge National Lab., Tenn.
E. Hirst.
J Environ Qual. 2(2), p 166-171, 1973.

Descriptors: Effluent, Waste water disposal, Heat exchange, Heat transfer, Heating, *Electric powerplant, *Environmental control, *Poultry, *Hogs, *Thermal pollution, *Farm wastes.
Identifiers: *Animal shelters, *Waste heat, *Pad and fan systems.

Waste heat could be used by farmers to provide environmental control for broilers and swine. The amount of waste heat which could be so used is about 1-2% of the total available from electric power plants. A proposed system for using waste heat involves conventional pad and fan systems with finned-tube coils mounted downstream of the pads. The potential savings to farmers in fuel and feed costs are significant. However, major problems exist which must be investigated to determine whether incentives exist to develop and implement such systems. The problems include economics, management, marketing, disposal of animal wastes, dispersion of farming units, size of agricultural operation, climate, and seasonality of waste heat demands.--Copyright 1973, Biological Abstracts, Inc.
W76-10507

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
J. E. Fritz.
August 1974. 53 p, 6 plates, 7 tab, append.

Descriptors: *Sewerage, *Water supply, *Treatment facilities, *Pollution control, Region, Water storage, Water consumption, Effluent, *Costs, *Pennsylvania, Watershed management, Feasibility studies, Waste water treatment.
Identifiers: *Lehigh Valley(Pa), Package treatment plant.

This report is necessary because of rapid development of the Lehigh Valley and because of Department of Housing and Urban Development requirements. Data are presented for: sanitary sewage facilities usage, including information on design capacities of facilities, municipalities and population served, flow in mgd, and proposed population service and flow; water supply sources, capacity (storage and daily use), areas served, number of connections where possible, and average daily consumption. Industrial, domestic usage is distinguished when possible; priority of projects in most municipalities in previous or future years and their current status is indicated. Part of its regional sewer and water plan the Joint Planning Commission must constantly re-evaluate in light of new plans by municipal areas so that plan revisions may be made. Tabulations list modifications which have been made to the 1970 plan. Major amendments are shown on maps. To update the plan it was necessary to give priority ratings to proposed projects. Five basic areas of concern were given point values: Guiding Orderly Growth and Development, 35 points; Financial Considerations, 20 points; Housing Considerations, 10 points; Health Considerations, 25 points; and Local Initiative, 10 points. These were further broken down into many small categories, each with specific number of points. For each of the approximately 100 proposed projects a point count is determined and thus the priority rankings for the whole group of projects are found. (Smith-North Carolina)
W76-10508

ENVIRONMENTAL INVESTIGATION OF EDEN ISLES,
Burk and Associates, Inc. (New Orleans).
Report prepared for State of Louisiana, Baton Rouge, August, 1975. 74 p, 20 fig, 2 tab, 50 ref, append.

Descriptors: Water quality, *Canal construction, *Canals, Water pollution, *Water quality standards, Environment, Sampling, Estuaries, Ecology, Planning, *Louisiana.
Identifiers: *Eden Isles(LA), *Lake Pontchartrain(LA), Lake Maurepas-Pontchartrain-Catherine-Borgne(MPCB) estuarine system, *Ecological impact, *Environmental impact.

Eden Isles, 5300 acres on the shores of Lake Pontchartrain near Slidell (LA), is planned as a high density development for 20,000 people inhabiting about 4,200 homesites situated along a system of dredged canals. The western section of 2,300 acre is presently being developed. For this study of the Eden Isles canal system the following were measured at 5 stations: water temperature, pH, dissolved oxygen, salinity, suspended solids, turbidity, biochemical oxygen demand, chemical oxygen demand, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, total nitrogen, total phosphates, chlorides, sulfates, and total and fecal coliform count. Data indicate bacterial problems at the channel entrance near homes in the development, and there is an excessive accumulation of nutrients and organics in the canals due to limited flushing and excessive depths. Comparison with similar Florida developments indicates that water quality will probably deteriorate in the canal system, though the timing will depend on rate of urban deveLopment rapidity of nutrient and organic buildup, and degree of implementation of recommended changes. With no changes noxious odors, fish kills and possible health problems are predicted. Water quality will be worse in warm summer months. In Lake Pontchartrain there will be reduced biological activity, physiochemical changes in the water quality of the immediate area. Seven recommendations are given concerning canal design, landscape modification, sewage treatment plant capacity, monitoring of water quality, enforcement of state standards, and state land purchases. (Smith-North Carolina)
W76-10510

MUNICIPAL WASTEWATER TREATMENT WORKS, MODEL FACILITY PLAN FOR A SMALL, RURAL COMMUNITY.
Environmental Protection Agency, Washington, D. C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-10511

CONTROL OF POLLUTION FROM ANIMAL FEEDLOTS,
Hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninety-third Congress, First Session, November 29 and 30, 1973. Washington, D. C., 2157 p.

Descriptors: *Feed lots, *Water pollution control, *Regulation, Farm wastes, *Pollution abatement, Water quality standards.

The Subcommittee on Conservation and Natural Resources held hearings on November 29 and 30, 1973 for the inauguration of an in depth study of manure. Attempts were made in these hearings to ascertain whether Federal pollution control laws are administered efficiently, economically, and so implemented as to control pollution from point sources such as animal feedlots. Testimonies were given from representatives of EPA and other Federal agencies and interested parties to determine the agencies' role in controlling pollution from animal feedlots. (Cameron-East Central)
W76-10533

AN ANALYSIS OF DAIRY WASTE MANAGEMENT ALTERNATIVES FOR SOUTHERN CALIFORNIA DAIRYMEN,
California Univ., Riverside. Agricultural Extension Service.
F. F. Smith, S. E. Bishop, W. W. Wood, Jr., J. C. Oliver, and W. C. Fairbank.
Agricultural Extension Service Publication, November, 1973, 14 p. 5 fig, 2 tab.

Descriptors: *Dairy industry, Costs, Water pollution, Density, Farm wastes, California, Water quality standards, Regulation, *Alternative costs, Alternative planning.
Identifiers: *Waste management, Southern California, *Porter-Cologne Water Quality Act(Calif).

The impact of the Porter-Cologne Water Quality Act is analyzed, and suggestions are made regarding the conditions under which the Southern California dairy industry can remain and be competitive with other dairy regions capable of supplying the market. Regulations designed to prevent pollution of surface and underground waters will require new management decisions for most Southern California dairymen. The requirements of compliance are: (1) contain and dispose of all polluted water on land owned or controlled by dairyman, and (2) limit the application of dairy wastes to each acre of cropland to that produced by 1.5 to 5 cows. Alternatives to each of these requirements are also listed. Eight factors which bear on the selection of these alternatives are (1) land values, (2) taxes on land, (3) cow density (or manure application) limitations imposed by water quality control agencies, (4) cow density limitations imposed by local governmental planning authorities, (5) production responses attributable to geographical region, (6) production responses attributable to the side effects of waste management facilities (heat, cold, mud, rain, injury, insects, disease), (7) operating costs attributable to various waste management systems, (8) net revenue realized from cropland used for waste disposal. A method of assessing the effects of these many variables is presented. (Cameron-East Central)
W76-10534

PREVENTING WATER POLLUTION FROM TURKEY OPERATIONS,
California Univ., Parlier.
J. P. Schroeder.
Poultry Digest, Vol. 34, No. 400, p. 240-241, June, 1975. 3 fig.

Descriptors: Water pollution, *Poultry, Design criteria, Construction, *California, *Regulation, *Farm wastes, Water quality standards, Waste treatment.
Identifiers: *Turkeys.

The California Regional Water Quality Control Board has prepared a survey of the turkey industry in the state to determine its status in relation to state and federal water quality regulations. Questionnaires are going to the turkey growing firms, the contractors, and they are responsible for getting the forms filled out for each of their growers. Sample questions are cited. The California regulations require turkey growers and poultry men to keep water runoff or excess water from their turkey and poultry operations on their farms or to dispose of it in such a manner as not to contaminate the subsurface water or the surface water of their neighbors and create a hazard to public health. For a number of years, turkey growers in central California have been building new facilities or remodeling old ones to conform to the requirements to prevent pollution of public waters. Growers have replaced older narrow shelters of the shed roof type with gabled-roof buildings, which have more height and width. Most of the construction has steel framing. (Cameron-East Central)
W76-10535

EPA PROPOSES NEW FEEDLOT REGULATIONS.
Wallaces Farmer, Vol. 100, No. 23, p. 9, December, 1975.

Descriptors: *Regulation, *Legal aspects, *Feed lots, Water pollution, Farm wastes, Water quality standards.

EPA proposals for new regulations for feedlot permits are advanced for scrutiny. Under the proposals, a feedlot operator will need a waste water discharge permit if: (1) Measurable wastes are discharged directly into any navigable waters that cross the feedlot. (2) Measurable wastes are discharged into navigable waters through a man-made drainage structure. (3) Operation includes more than: 1000 slaughter and feeder cattle, 700 mature dairy cattle, milking or dry, 4500 slaughter hogs, 35,000 feeder pigs, 12,000 sheep or lambs, 55,000 turkeys, 180,000 laying hens, 290,000 broiler chickens. (4) The operation is designated as a significant pollution source by EPA or state water pollution control agencies. If a feeding operation includes a waste control system that keeps wastes from discharging into navigable waters, such as a pit or lagoon, a permit probably won't be needed. (Merryman-East Central)
W76-10536

WATERWAY CLEANS FEEDLOT RUNOFF,
For primary bibliographic entry see Field 5D.
W76-10537

ANNUAL CYCLE OF SPORTFISHING ACTIVITY AT A WARMWATER DISCHARGE INTO GALVESTON BAY, TEXAS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
A. M. Landry, Jr., and K. Strawn.
Trans Am Fish Soc. 102(3), p 573-577, 1973.

Descriptors: *Texas, *Sport fishing, *Thermal pollution, Bays, Heated water, Surveys, Water temperature, Flow rates.
Identifiers: Arius-felis, Cynoscion-arenarius, Leiostomus-xanthurus, Micropogon-undulatus, Pogonias-cromis, Sciaenops-ocellata, *Galveston Bay(Tex).

A survey of sportfishing activity at the P. H. Robinson Generating Station discharge into Galveston Bay, Texas was taken from 21 Oct. 1968 through 8 Nov. 1969. During 108 daily checks, 1063 fishermen were interviewed and 2635 fish counted. Fishing activity was related to season and temperature of the heated effluent. Maximum fishing pressure and largest catches occurred during the period Dec. 1968 through April 1969 and Nov. 1969 when discharge water temperatures and flow rates were minimum. Lowest angling activity and catch rates were recorded from June through Sept. 1969 when water temperatures approached 40 degrees C in the upper part of the fishing area. Atlantic croaker, Micropogon undulatus; sea catfish (hardhead), Arius felis; sand seatrout, Cynoscion arenarius; black drum, Pogonias cromis; red drum, Sciaenops ocellata; and spot, Leiostomus exanthurus, in order of decreasing abundance, accounted for 96.7% of the fish counted during the study. Seine, trawl, and trammel net data taken from the outfall area indicated that creel survey data of fishing pressure and angling success were valid indicators of fish concentration.--Copyright 1974, Biological Abstracts, Inc.
W76-10541

INTACT MANURE PACKS HALT SEEPAGE.
Hoards Dairyman, Vol. 120, No. 18, p 1087, September 25, 1975.

Descriptors: *Feed lots, *Odor, *Cattle, *Seepage control, Rainfall, Water pollution control, Water pollution sources, Farm wastes.
Identifiers: *Soil pollution, *Manure packs.

A four-year research project has shown that cattle feedlots do not pollute soil and groundwater if they have an intact manure pack and about one animal per 200 square feet. Scientists of USDA's Agricultural Research Service have found that an intact manure pack eliminates water infiltration and movement of contaminants through the soil to the groundwater. Fred A. Norstadt and Harold R. Duke conducted a study utilizing commercial and experimental feedlots without concrete floors. To gather data on water content and chemical movement, the researchers installed three cased dry wells in one of the feedlots and a similar well in a nearby alfalfa field. Nitrate nitrogen concentration was highest near the manure-soil interface. This nitrogen concentration decreased markedly with depth. Nitrate nitrogen content in the water table under each well fell into the same range as had been determined in 1912 before feeding operations were established. In relation to odor, Norstadt theorizes that odors produced by feedlots can be reduced and partially controlled by such improved management practices as using sawdust and wood chips for bedding and stirring the manure pack. A special feedlot was built to test what effect such practices would have on water, salt and nitrogen movement beneath a feedlot. One year of testing has shown that proper management results in no pollution hazard to soil or water beneath the feedlot. (Cameron-East Central)
W76-10544

WATER QUALITY IN A RECIRCULATING RACEWAY SYSTEM FOR FISH CULTURE,
Coastal Plain Experiment Station, Tifton, Ga. Dept. of Entomology and Fisheries.
T. K. Hill, and J. L. Chesness.
Presented at 1973 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 11-14, 1973, Paper No. 73-5508, 14 p. 2 fig, 5 tab, 4 ref.

Descriptors: *Fish farming, *Water quality, *Recirculated water, Rainbow trout, *Channel catfish, Water pollution effects, Animal parasites, Fish diseases, Fish reproduction.

Four seasons of fish production in an 8-segment recirculating earthen raceway system at the Coastal Plain Experiment Station, Tifton, Georgia, are discussed. Rainbow trout were raised during the winter and Channel Catfish were raised during the summer. Purina Trout Chow was fed twice daily to trout at rates of 2-2 1/2 percent body weight and once daily to Channel Catfish at rates of 1-3 percent body weight. Catfish were parasitically infested by Cleidodiscus, Scyphidia, and Trichodina during the studies. Trout were infested by Gyrodactylas and Trichodina. All conditions were effectively treated with 30 ppm of formalin. Raceway water was periodically sampled and dissolved oxygen, total hardness, pH, CO2, ammonia, turbidity, and visibility were measured. The fish were harvested at the end of each season. Experimental results indicate that recirculating raceways provide an easily manageable (treatment, feeding, and harvesting) production system for fish culture. Year-round fish production in a temperate climate can be accomplished by alternately growing Rainbow Trout and Channel Catfish as described. Eight inch long fingerlings should be stocked so that marketable size fish can be attained in the double-crop system. Maximum fish production capacity was not reached during the two-year study. Water quality was still good by the end of the study. It was felt that natural restorative capacity of the system combined with man-made systems (physical, chemical, biological) should provide water quality suitable for significantly increasing fish production. (Merryman-East Central)
W76-10546

FARM ANIMAL MANURES: AN OVERVIEW OF THEIR ROLE IN THE AGRICULTURAL ENVIRONMENT,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
J. Azevedo, and P. R. Stout.
California Agricultural Experiment Station Extension Service Manual 44, University of California, Berkeley, August, 1974, 109 p. 27 fig, 29 tab, 401 ref.

Descriptors: *Farm wastes, Agriculture, *California, Chemical properties, Physical properties, Decomposition, Environmental effects, Fertilizers, Fuels, Waste disposal.

An overview is presented of the status of livestock manures, their interrelationship with society as well as agriculturists, the problems they create, and the possibilities they offer as sources of energy and of soil enrichment. Specific topics discussed are: (1) animal manures in California, (2) quantity of manure produced by domestic animals, (3) chemical and physical characteristics of manures, (4) decomposition of manures, (5) nuisance factors of manures, (6) effects of manure on water quality and water-body ecology, (7) animal manures as factors in disease transmission, (8) prejudices regarding use of animal manures, (9) fertilization with manures, (10) manure as a soil amendment, and (11) alternative uses of manures. (Cannon-East Central)
W76-10548

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, METAL FINISHING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
J. R. Ginn, A. Hill, and E. V. Blanchard, Jr.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 803, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/19, June 1975, 152 p. WQ4AC013.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Economic justification, Engineering costs, Industrial wastes, Estimated costs, Forecasting, Metals, Water pollution.
Identifiers: *Metal finishing industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The cost of metal finishing in the United States is expected to double in the coming years as a result of the requirements set by the Federal Water Pollution Control Act Amendments of 1972. This will result in a price increase of from three to five percent of finished goods utilizing metal finishing. A period of turmoil may be expected in the industry during the transitional period. Most effected will be small independent job shops, many of which can be expected to go out of business, and small captive shops. Large shops of all kind can generally be expected to survive, mainly because of economies of scale in waste treatment methods. (NCWQ)
W76-10556

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRON AND STEEL INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
A.-L. Lin, R. A. Leone, and J. R. Glenn.
National Commission on Water Quality, Washington, D.C. Report NCWQ 75/18, November 1975, 112 p. WQ4AC013.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Industrial wastes, Engineering costs, Estimates, Forecasting, Iron, Steel, Water pollution control.
Identifiers: *Iron and steel industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

An analysis is presented of the costs and economic impacts of the Federal Water Pollution Control Act of 1972 on the iron and steel industry (SIC 311). Price rises are foreseen as a result of increased capital and operation and maintenance

requirements, rising gradually from about 0.8 percent in 1977 to 1.5 percent in 1983. Such increases in the domestic steel price will tend to stimulate imports and discourage exports, contributing to a reduction in domestic shipments of 0.2 percent in 1977, 0.6 percent in 1983 and 0.9 percent in 1990. Pollution control will require capital to finance pollution abatement facilities which could impede investment in steelmaking facilities and initiate further repercussions within the industry. As the steel industry is very much affected by general business conditions, the law's major impact on the industry may be its macro impact on the general economy. (NCWQ)
W76-10557

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PULP AND PAPER INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
R. A. Leone, R. Startz, and M. Farber.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 801, $10.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/17, June 1975, 317 p. WQ4AC013.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Economic justification, Engineering costs, *Pulp and paper industry, *Estimated costs, Industrial wastes, Forecasting, Cost-benefit analysis, Water pollution.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

Estimates are presented of costs and their impacts necessary to meet 1977 and 1983 requirements of the Federal Water Pollution Control Act in the pulp and paper industry (SIC 2611, 2621, 2631, 2661). Highest costs will be experienced (among sub-categories of the industry) among groundwood, paperboard from wastewater, non-integrated tissue and non-integrated coarse mills. Among regions, New England, New York, the Middle Atlantic States and the North Central U.S. will be most affected. Approximately 80 mills representing 4.5 percent of total industrial capacity are considered endangered. Cost benefit analyses of technologies show manufacturers can effect cost reductions through altering product or process mix, reducing strength of cardboard cartons, and reducing weight, strength and thickness of paper. Early introduction of process changes to meet projected 1983 requirements is found economically justified. (NCWQ)
W76-10559

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PETROLEUM REFINING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
J. L. Smith, and R. A. Leone.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-248 800, $9.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/16, June 1975, 232 p. WQ4AC013.

Descriptors: *Pollution abatement, *Oil industry, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Economic justification, Engineering costs, Industrial wastes, *Economic impact, *Estimated costs, Forecasting, Water pollution.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Petroleum refining industry, Water pollution abatement technology.

Two hundred and fifty refineries were operating in the U.S. and Puerto Rico as of January 1, 1974; the existence of at most 12, representing less than one percent of the domestic refinery capacity, is likely to be endangered by the effluent limitations promulgated by the U.S. Environmental Protection Agency under the Federal Water Pollution Control Act of 1972. Variations in the complexity of the refining products were found to significantly affect the estimated levels of water pollution abatement as between one refinery and another. Consumer demand for petroleum products clearly appears strong enough to absorb the abatement cost increase for the remaining 99 percent. (NCWQ)
W76-10560

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, LEATHER TANNING INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 019, $6.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/42, November 1975, 113 p. WQ5AC011.

Descriptors: *Pollution abatement, *Tannery wastes, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Costs, Economics, Evaluation, Industrial wastes, Engineering costs, Capital costs, Operating costs, Maintenance costs, Forecasting, Industrial plants, Water pollution control.
Identifiers: *Leather tanning industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The economic impacts on the leather tanning industry of achieving the 1977 (BPT) and 1983 (BAT) limitation requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) were assessed. The capital requirements for the industry total over $58 million with annual O and M costs of almost $15 million for plants requiring pretreatment and BPT. The additional amounts needed for BAT controls are $35 million capital and over $6 million O and M. Resulting price increases will be an estimated 1.6 percent over baseline in 1977 and 2.2 percent over baseline in 1983. Production lost from plant closures as a result of the Act is estimated at less than 10 percent of industry volume. As a result of plant closures, industry employment will be 950 less than baseline in 1977 and 925 less than baseline in 1983.(NCWQ)
W76-10561

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FERTILIZER INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 017, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/39, November 1975, 163 p. WQ5AC011.

Descriptors: *Pollution abatement, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Industrial wastes, Forecasting, Industrial plants, Engineering costs, *Fertilizers, Water pollution.
Identifiers: *Fertilizer industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

An examination is made of the economic impacts of the Federal Water Pollution Control Act Amendments of 1972 on the fertilizer industry (SIC 2873, 2874). Price increases of 1.5% or less can be expected as a result of BPT (best practicable treatment technology) pollution controls, while negligible increases in all but amonium nitrate should result from BAT (best available technology) controls. Profits will be reduced for all plants installing pollution controls, but no plant will become unprofitable solely as a result of pollution controls. Small, older plants may close as a result of pollution controls, but will be replaced by larger, more modern plants. Employment, community and international trade impacts are expected to be relatively insignificant. (NCWQ)
W76-10562

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PLANT CLOSURES.
National Bureau of Economic Research, Inc., New Haven, Conn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 015, $4.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/38, June 1975, 61 p. WQ4AC013.

Descriptors: *Pollution abatement, Federal Water Pollution Control Act, Economics, Evaluation, *Regional analysis, Estimated costs, *Economic impact, Forecasting, Industrial wastes, Economic justification, Water pollution, *Industrial plants, *Industries.
Identifiers: *Industrial plant closures, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The kinds of plants most likely to close as a result of the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) are discussed. A regional vulnerability analysis was used, which examined past trends in plants and regional growth. Six industires -- textiles, pulp and paper, petroleum refining, iron and steel, non-ferrous metals and electroplating -- are examined. Most highly impacted industries will be the small plants, with fewer than 100 employees, and single branch plants. (NCWQ)
W76-10563

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-248 807, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/23, July 1975, 150 p. WQ5AC091.

Descriptors: Erosion, Federal Water Pollution Control Act, *Economic impact, *Farm wastes, *Return flow, Prices, Soil conservation, Water pollution sources, Irrigation, *Agricultural runoff, Evaluation, Runoff, *Erosion control, Economics, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Commodity prices, Water pollution abatement technology.

Economic impacts are considered arising from control of irrigated return flows and pollutant runoff. It is found that return flow controls of any level can be imposed with little impact in terms of commodity prices. Overall impact in the agricultural sector is also minor. Certain control strategies, however, can have a more measurable impact in selected regions. The overall impact of erosion control will be to increase commodity prices and provide a direct impact on the consumer. (NCWQ)
W76-10564

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, NON-FERROUS METALS INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.

L. Wu. Lee, R. A. Leone, and C. Smith.
Available from the National Technical Information Service Springfield, Va. 22161, as PB-248 804, $7.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/20, June 1975, 200 p. WQ4AC013.

Descriptors: *Pollution abatement, Cost analysis, Evaluation, Economics, Engineering, Federal Water Pollution Control Act, Estimated costs, Economic justification, Forecasting, Metals, Copper, Zinc, Lead, Aluminum, Industrial wastes, *Economic impact.
Identifiers: *Non-ferrous metals industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

The requirements of the Federal Water Pollution Control Act Amendments of 1972 will alter the cost structure of non-ferrous smelters and refineries (primarily aluminum, copper, lead and zinc). In the short run, impacted plants may not feel immediate effects but in the long run, plants whose revenues fail to recover total costs of production and water pollution abatement will close. Abatement requirements will affect the availability of capital for new capacity expansion. These cost changes may affect the domestic industry's position in foreign competition. (NCWQ)
W76-10565

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, TEXTILE INDUSTRY.
National Bureau of Economic Research, Inc., New Haven, Conn.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-249 948, $7.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/31, June 1975, 163 p. WQ4AC013.

Descriptors: *Pollution abatement, *Textiles, *Economic impact, Cost analysis, Federal Water Pollution Control Act, Economics, Evaluation, Industrial wastes, Economic justification, *Estimated costs, Forecasting, Water pollution.
Identifiers: *Textile industry, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

This study is an analysis of the economic impacts of the 1972 Federal Water Pollution Control Amendments (PL 92-500) on the industry. An introductory discussion of the economic, technological, and institutional environment within which the textile industry operates is followed by a discussion of water pollution abatement costs and their impact on the industry. The analysis suggests that approximately 5% of the capacity in the industry will be endangered by the requirements of the law. The most severely impacted subcategories of the industry will be woven and knit fabric finishing and wool dyeing. New England and the Mid-Atlantic will be the hardest hit regions. (NCWQ)
W76-10566

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-249 947, $13.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/36, December 1975. 528 p, 8 fig, 67 tab. WQ5AC017.

Descriptors: Water pollution, *Cities, *Decision making, *Pollution abatement, *Alternative costs, Costs, Waste water treatment, *Treatment facilities, Water quality, Municipal wastes, Municipal water, Local governments, Federal Water Pollution Control Act.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Those decisions and their associated costs made by communities to meet the requirements of the Federal Water Pollution Control Act of 1972 are examined and compared to alternative decision costs (i.e. least cost decisions). Decisions on secondary treatment works were found to largely depend on the consultant and hi< interaction with state and Federal authorities and were not sensitive to cost or municipal classification. Different federal incentive programs will not change the range and relative mix of technologies. The federal program could motivate more water pollution control if institutional mechanisms were organixed more vigorously to enforce the least cost criterion. More careful attention to alternatives in preliminary studies is suggested, including demographic and industrial projections and per capita water usage. (NCWQ)
W76-10568

WATER POLLUTION CONTROL ACT OF 1972, SOCIAL IMPACTS, EIGHT CASE STUDIES.
Abt Associates, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-250 106, $13.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/35. June 1975, 554 p. WQ5AC014.

Descriptors: Pollution abatement, Federal Water Pollution Control Act, Water pollution, *Social impact, Evaluation, Economics, Waste water treatment, Treatment facilities, Forecasting, Social change.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Water cleanup in eight geographically dispersed U. S. communities was found to at first curtail and then encourage development, improve water quality, intensify land use and waste water management planning and promote citizen participation. These case studies do not necessary make up a representative sample of eight communities. Social impacts of the Federal Water Pollution Control Act of 1972 will most often be felt through people's occupations. Construction appears to be the sector of local economies and occupational groups that is most sensitive to the benefits and costs associated with the Act. Demographic groups that will be most affected by the Act are (1) males, (2) people aged 31 to 60, and (3) moderate income people. The law is seen by localities to be significantly improving professional quality and comprehensiveness of wastewater management planning. (NCWQ)
W76-10569

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 1).
Utah Water Research Lab., Logan.
National Commission on Water Quality, Washington, D. C. Report NCWQ 75/33-Pt 2, October 1975. 649 p, 65 fig, 55 tab. WQ5AC054.

Descriptors: *Salinity, *Colorado River Basin, *Regional analysis, River basins, *Capital costs, Water pollution, *Pollution abatement, Waste water treatment, Public law, Federal Water Pollution Control Act, Water law, Economic analysis, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Environmental, economic, social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Colorado River Basin are reviewed. Salinity, the most critical water quality problem in the basin, will be only slightly reduced by the NPDES permit program set up by the Act. A basin-wide program of irrigation efficiency will reduce the 9.0 million tons of salt carried by the river annually by 2.2 million tons. Total capital costs (in 1973 dollars) will be $160 million to achieve the Act's 1977 requirement of best practicable treatment technology, with an additional $35 million to achieve best available technology by 1983. Part 1 is primarily concerned with basin profiles and detailed analyses. (See also W76-10571) (NCWQ)
W76-10570

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 2),
Utah Water Research Lab., Logan.
National Commission on Water Quality, Washington, D. C. Report NCWQ 75/33-Pt 1, October 1975. 763 p, 18 fig, 51 tab. WQ5AC054

Descriptors: *Salinity, *Colorado River Basin, *Regional analysis, River basins, *Capital costs, Water pollution, Waste water treatment, Pollution abatement, Public law, Federal Water Pollution Control Act, Water law, Economic analysis, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Environmental, economic social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Colorado River Basin are reviewed. Salinity, the most critical water quality problem in the basin, will be only slightly reduced by the NPDES permit program set up by the Act. A basin-wide program of irrigation efficiency will reduce the 9.0 million tons of salt carried by the river annually 2.2 million tons. Total capital costs (in 1973 dollars) will be $160 million to achieve the Act's 1977 requirement of best practicable treatment technology, with an additional $35 million to achieve best available technology by 1983. Part 2 is primarily concerned with environmental site studies. (See also W76-10570) (NCWQ)
W76-10571

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME I),
Little (Arthur D.), Inc., San Francisco, Calif.
Available from the National Technical Information Service, SpringfielD Va., 22161, as PB-249 730, $21.25 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington D. C. Report NCWQ 75/27-Vol 1, Nov. 1975. 294 p, 31 fig, 75 tab. WQ5AC053.

Descriptors: *Pollution abatement, California, *Regional analysis, River basins, Bays, Waste water treatment, Water pollution sources, Water resources, Federal Water Pollution Control Act, Water supply, Public law, Water law, Economic analysis, Forecasting.
Identifiers: *Central Valley(Calif), *Federal Water Pollution Control Act Amendments of 1972, *San Francisco Bay(Calif).

The environmental, social, economic and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the San Francisco Bay/Central Valley are reviewed. Point source programs will result in a high level of effluent discharge with minimal adverse environmental and economic impacts, and positive benefits in improved fishery and water recreation uses, and conservation of water supplies. The water pollution control effort in the study areas directly related to water quantity. Among the problems remaining are control of agricultural wastewater and urban runoff. Estimated capital costs (in 1973 dollars) of industrial waste treatment to achieve the 1977 requirement of best practicable treatment technology and the 1983 goal of best available technology will be $41.1 million and $91.8 million respectively O and M will be $5.2 million for 1977 and $14.6 million for 1983. Volume I is primarily concerned with background information and pollution source by subareas. (See also W76-10573) (NCWQ).
W76-10572

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME II),
Little (Arthur D.), Inc., San Francisco, Calif.
Available from the National Technical Information Service Springfield, Va., 22161, as PB-249 730, $21.25 in paper copy $3.00 in microfiche. National Commission on Water Quality, Washington D.C. Report NCWQ 75/27 - Vol. 2, November 1975 523 p. WQ5AC053

Descriptors: *Pollution abatement, California, *Regional analysis, River basins, Bays, Waste water treatment, Water pollution sources, Water resources, Water supply, Federal Water Pollution Control Act, Public law, Water law, Economic analysis, Forecasting.
Identifiers: *Central Valley(Calif), *Federal Water Pollution Control Act Amendments of 1972, *San Francisco Bay(Calif).

The environmental, social, economic and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500) on the San Francisco Bay/Central Valley are reviewed. Point source programs will result in a high level of effluent discharge with minimal adverse environmental and economic impacts, positive benefits in improved fishery and water recreation uses, and conservation of water supplies. The water pollution control effort in the study area is directly related to water quantity. Among the problems remaining are control of agricultural wastewater and urban runoff. Estimated capital costs (in 1973 dollars) of industrial waste treatment to achieve the 1977 requirement of best practicable treatment technology the 1983 goal of best available technology will be $41.1 million and $91.8 million respectively. O and M will be $5.2 million for 1977 and $14.6 million for 1983. Volume II is primarily concerned with pollution loadings and discharge, costs of abatement, and agricultural, urban stormwater runoff. (See also W76-10572) (NCWQ)
W76-10573

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT, VOLUME I,
Environmental Law Inst., Washington, D. C.
W. A. Irwin, E. I. Selig, K. Hall, R. A. Liroff, and A. S. Miller.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-246 321, $12.50 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/12-1 October 1975, 479 p. WQ5AC043.

Descriptors: *Law enforcement, Federal Water Pollution Control Act, *Institutions, Evaluation, Social participation, Regulation, Water law, Water pollution, Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Public participation.

The Federal Water Pollution Control Act Amendment of 1972 set up a national permit system to control the discharge of pollutants and provides a balance of Federal and state regulatory powers for enforcement of these permits. A criterion for effectiveness in enforcement is whether water pollution officials are acting decisively with respect to violations that involve matters of fault. While it is too early to judge the effectiveness of enforcement, several patterns were found: both federal and state agency prefer bargaining and administrative approaches to obtain compliance; compliance by federal facility and municipalities is tardy; the enforcement authority granted EPA has provided valuable federal reinforcement for state enforcement efforts; citizen suits have principally been directed at EPA implementation of FWPCA rather than discharger non-compliance with its requirements. Authors suggest alternative strategy for enforcement such as authorization for administrative assessment of civil penalties and ammendments, section 309 of the Act. (See also W76-10575) (NCWQ)
W76-10574

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT VOLUME II,
Environmental Law Inst., Washington, D. C.
W. A. Irwin, E. I. Selig, K. Hall, R. A. Liroff, and A. S. Miller.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-246 322, $18.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington D. C. Report NCWQ 75/12-2, October 1975. 1,132 p. WQ5AC043.

Descriptors: *Law enforcement, Federal Water Pollution Control Act, Administration, *Institutions, Evaluation, Social participation, California, Texas, Water law, Georgia, Ohio, Maine, Maryland, Iowa, Water pollution, Waste water treatment.
Identifiers: *Public administration, *Federal Water Pollution Control Act Amendments of 1972.

Volume II contains case studies describing enforcement activities under the Federal Water Pollution Control Act Amendments and state laws as they are being carried on in eight states-- California, Georgia, Iowa, Maine, Maryland, Ohio, Texas and Utah by both state and federal agencies. Relationships are described as they exist between state agencies, the regional offices of the Environmental Protection Agency and local industries, and municipalities. While it is too early to judge the effectiveness of enforcement, authors found several patterns: both federal and state agencies prefer bargaining and administrative approaches to obtain compliance; compliance by federal facilities and municipalities is tardy; the enforcement authority granted EPA has provided valuable federal reinforcement for state enforcement efforts; citizen suits have principally been directed at EPA implementation of the FWPCA rather than discharger non-compliance with its requirements. (See also W76-10574) (NCWQ)
W76-10575

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 931, $6.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/62, July 1975. 165 p, 5 fig, 10 tab, 5 ref. WQ5AC029.

Descriptors: Sites, *Environmental effects, Evaluation, *Iowa, Rivers, Federal Water Pollution Control Act, River basins, Ecology, Environment, Water pollution effects, Pollution abatement, Water quality, Forecasting, Waste water treatment.
Identifiers: *Iowa-Cedar River Basin, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis at the Iowa-Cedar River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality conditions and (2) projected resulting water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 924, $9.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/51, April 1975. 255 p, 51 ref. WQ5AC035.

Descriptors: Rivers, *Connecticut River, *Environmental effects, Ecology, Evaluation, River basins, *Massachusetts, Environment, Federal Water Pollution Control Act, Limnology, Water pollution effects, Forecasting, Water quality, Waste water treatment, Sites.
Identifiers: *Environmental impact assessment, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis and environmental impact assessment at the Connecticut River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission. (NCWQ)
W76-10577

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 928, $6.00 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/54, April 1975. 137 p, 85 fig, 13 tab, 7 ref. WQ5AC029.

Descriptors: Sites, *Environmental effects, Evaluation, Rivers, Federal Water Pollution Control Act, River basins, *North Carolina, *South Carolina, Ecology, Environment, Water pollution effects, Pollution abatement, Water quality, Forecasting, Waste water treatment.
Identifiers: *Santee River Basin, *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis at the Santee River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the Commission. (NCWQ)
W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 927, $5.50 in paper copy $3.00 in microfiche. National Commission on Water Quality, Washington, D. C.

Report NCWQ 75/59, February 1976. 115 p, 41 ref. WQ5AC027.

Descriptors: Sites, *Columbia River, *Environmental effects, Rivers, Evaluation, *Washington, *Oregon, River basins, Ecology, Federal Water Pollution Control Act, Environment, Water pollution effects, Pollution abatement, Water quality, Forecasting, Waste water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

A comprehensive water quality analysis at the Columbia River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P. L. 92-500). The study (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sector of the Commission. (NCWQ)
W76-10579

BENEFITS FROM WATER POLLUTION ABATEMENT, PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
D. M. Dornbusch, C. O. Falcke, P. M. Gelb, and L. W. Kozimor.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-248 805, $9.75 in paper copy, $3.00 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/21, December 1975. 326 p, 32 fig, 27 tab, 43 ref. WQ5AC006.

Descriptors: *Pollution abatement, *Benefits, *Property values, Economics, Evaluation, Social change, Attitudes, Forecasting, Aesthetics, Wildlife, Recreation, Lakes, Rivers, Real property, Value, Water pollution.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Water pollution abatement technology.

Increases in property values resulting from water pollution abatement programs depend on how changes are perceived, the type and size of the water body, and visual and physical access to the water body. Lay persons relate to quality of water in terms of its (1) wildlife support capacity, (2) recreational opportunities and (3) aesthetic aspects. Residents near large lakes with good or unlimited public access receive the largest benefits, while those living by small rivers with limited public access derive smaller benefits. Magnitude of benefits is also influenced by the type of community, especially its traditional relation to water. Seventeen site descriptions are presented: Lake Washington (2 sites); Green Lake, Wisc; Marion Millpond, Wisc; Mystic River, Conn.; Willamette, Ore.; Kanawha, W. Va.; Rockaway, N. J.; Navesink and Shrewsbury, N. J.; Lake Charles, La.; St. John's, Fla.; Kalamazoo, Mich.; Brown's Lake, Wisc.; Hart, Mich.; Minetonka, Minn.; Big Sioux, S. D.; and San Diego Bay, Calif. (NCWQ)
W76-10580

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 6A.
W76-10582

RATIONALE FOR A WATER POLLUTION CODE (PART II): SOCIAL ASSESSMENT,
Caldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis.
International Journal of Environmental Studies, Vol. 8, No. 2, p. 113-120, 1975. 19 ref.

Descriptors: *Water quality control, *Social values, *Welfare(Economics), *Water quality standards, *Value engineering, Australia, Decision making, Attitudes, Environmental sanitation, Economic efficiency, Estimating, Analytical techniques.
Identifiers: Water Pollution Code.

Waste control management decision making based on the objectives of (1) continued health and survival of man and other components of the biosphere; (2) equal distribution of social welfare; and (3) short term maximization of social welfare for the people involved in a specific region, utilizing social assessment by cost-benefit analysis and the preference analysis techniques are discussed. The social welfare function gives a quantitative description of community satisfaction enabling a waste management authority to make quantitative decisions on the basis of the objectives. The methodology of the cost-benefit and preference analyses are described and the application of preference analyses will lead to refinements, increased accuracy and greater confidence in its use. However, in view of the assumptions and inaccuracies involved in developing a social welfare function, it is advisable to use both the cost-benefit and the relative preferences approaches to quantifying satisfaction. A social welfare function reduces the highly complex processes of human perception, habit, and satisfaction to a relatively simple form, which can only approximate the true situation but it may be possible to represent the preferences, and the level of satisfaction of a community, to within an order of magnitude, thus generating results for a compromise water quality standard. (Auen-Wisconsin)
W76-10592

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. V. Watkins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 861, $5.50 in paper copy, $3.00 in microfiche. Report No. EPA 440/1-74-039-a, December 1974. 124 p. 17 fig., 24 tab., 20 ref.

Descriptors: *Effluents, Standards, *Waste water treatment, *Grains(Crops), *Industries, Cereal crops, Wheat, Feeds, Technology, Water utilization, Pollutants, Electric power costs, Estimated costs, *Water quality standards, Water pollution control.
Identifiers: *Grain milling industry, Breakfast cereal manufacturing, Animal feed manufacturing, Wheat starch/gluten manufacturing.

Effluent limitations guidelines are proposed for the animal feed, hot cereal, ready-to-eat cereal, and wheat starch/gluten manufacturers that can be attained through the application of the Best Practicable Control Technology Currently Available, the Best Available Technology Economically Achievable by July 1, 1977 and July 1, 1983, respectively; and performance standards for the degree of effluent reduction that is achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives. Treatment technologies are recommended for the two subcategories with allowable discharges--ready-to-eat cereal and wheat starch/gluten manufacturing; the technologies are generally similar and may include equalization and biological treatment followed by secondary clarification. Additional solids removal techniques will be required for higher solids removal to meet the 1983 limitations. The estimated investment cost for an entire treatment system for a medium-sized ready-to-eat cereal plant with production of 226,800 kg/day is $812,000. An additional $64,000 will be required to meet the 1983 standards. Investment costs for a typical wheat starch plant with a capacity of 45,400 kg/day are $964,000 for 1977 and $966,000 for 1983. Supportive data and rationale for development of the proposed effluent limitations guidelines and performance standards are presented. (Auen-Wisconsin)
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
R. T. Gregg.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 860 $5.00 in paper copy, $3.00 in microfiche. Report No. EPA 440/1-74-035-a, December 1974. 99 p. 5 fig., 12 tab., 35 ref.

Descriptors: *Effluents, Standards, *Waste water treatment, Industries, *Asbestos, Technology, Pollution abatement, Dusts, Sealants, Linings, Insulation, *Water quality standards, Water pollution control.
Identifiers: Asbestos textiles manufacture, Asbestos gaskets manufacture, Asbestos packing manufacture, Friction materials manufacture.

The degree of effluent reduction attainable by the application of the Best Practicable Control Technology Currently Available and by the Best Available Technology Economically Achievable, effective July 1, 1977 and July 1, 1983, respectively, are delineated for these segments of the industry. Performance standards for new sources of waste waters are also prescribed. Water is not used in most plants during the manufacture of asbestos textiles, friction materials, and asbestos gaskets, packing and sealing devices and waste water is not generated. However, process-related waste waters are generated by manufacturing operations or by air pollution equipment in a few plants. The industry is subcategorized by raw waste loads, volumes and rates of waste water discharges, and differences in applicable in-plant control measures and end-of-pipe treatment technologies in the coating, or finishing, of asbestos textiles, solvent recovery, vapor absorption, and wet dust collection operations. The estimated investment cost of achieving the 1977 limitations and standards by all plants in the industry is approximately $200,000 (in 1971 dollars), excluding additional land acquisition costs. The cost of achieving the 1983 level is estimated to be less than $800,000. The investment and annual costs associated with the alternative control technologies for the four subcategories, as well as the effluent quality associated with each alternative, are summarized. (Auen--Wisconsin)
W76-10595

OCEAN BOUNDARIES AND PETROLEUM RESOURCES,
Princeton Univ., N.J. Dept. of Geology.
For primary bibliographic entry see Field 6E.
W76-10596

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,

For primary bibliographic entry see Field 5B.
W76-10599

MARINE TECHNOLOGY SOCIETY EIGHTH ANNUAL CONFERENCE PREPRINTS,
Marine Technology Society, Washington, D.C.
Marine Technology Society Eighth Annual Conference, held in Washington, D.C., September 11-13, 1972. Preprints, 1972. 782 pages.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Resources Development, *Water quality control, Coasts, Estuaries, Fisheries, Sediments, Buoys, Data processing, Mining, Instrumentation.
Identifiers: *Outer Continental Shelf, *Offshore technology, Energy sources.

This is a collection of preprints of papers to be presented at the 8th annual conference. The papers are arranged according to the following subject groupings: Buoy Technology, Cables, Coastal Zone Management, Education, Sediments, Fisheries, Data and Information Systems, Ocean Mining and Environmental Considerations, Nuclear Sources, Power Systems, Social Values - Ocean Resources Development, Search and Salvage, Instrumentation, Ships, Undersea Ships, Underwater Photography, and Water Quality. Pertinent papers are separately abstracted. (See W76-10601 thru W76-10603) (Sinha-OEIS)
W76-10600

AN ENVIRONMENTAL ANALYSIS OF A SIMULATED SEA-FLOOR MINING OPERATION,
Marine Minerals Technology Center, Tiburon, Calif.
R. N. Roby.
In: Marine Technology Society Eighth Annual Conference, held in Washington DC, September 11-13, 1972. Preprints, 1972. p 375-380, 9 ref.

Descriptors: *Resources development, Water resources, *Mining, *Environmental effects, *Water quality control, Metals, Minerals, Continental shelf, Regulation.
Identifiers: *Outer Continental Shelf, Mineral deposits, Baseline studies.

The increase in demand for minerals in recent years suggests that mining activity will increase on the continental shelf. Personnel at the Marine Minerals Technology Center, National Oceanic and Atmospheric Administration, are attempting to define the environmental problems that will result from recovering minerals from the sea floor. What are the problems or fears of problems that would result from offshore mining. These fears probably can be grouped into three categories: (1) the disturbance of fisheries ecology and habitats; (2) coastal erosion and degradation of recreational beaches, and (3) hazards to navigation, submarine cables, and pipelines. A simulated mine model has been designed for study. It is obvious that personnel of a mining company must obtain much information about an offshore mine site before the operations could start. During sea-floor deposit evaluation, much environmental data should be determined during the drilling. Finally, before any mining activity starts, clearance would be required from various agencies. If the operation were within the 3-mile limit, permits would be required from: U. S. Army Corps of Engineers, U. S. Coast Guard, and California State Lands Division (or a similar agency of other states). If the operation were beyond the 3-mile limit, permits would be required from: U. S. Geological Survey and the U. S. Bureau of Land Management. (See also W76-10600) (Sinha-OEIS)
W76-10601

THE ENVIRONMENTAL IMPACT OF DEEP-SEA MINING,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
O. A. Roels, A. F. Amos, C. Garside, and T. C. Malone.
In: Marine Technology Society Eighth Annual Conference, held in Washington DC, September 11-13, 1972. Preprints, 1972. p 369-373, 1 ref.

Descriptors: *Mining, *Environmental effects, *Resources development, Water resources, *Water quality control, Continental Shelf, Biota, Benthos, Sediments, Dredging, Baseline studies, Ecosystems, Monitoring, Manganese, Metals.
Identifiers: *Outer Continental Shelf, *Environmental impact, *Ferromanganese deposits, Pelagic biota, Bottom water.

The proposed mining of ferromanganese deposits from the deep sea will have a measurable effect on benthic and pelagic environments within the mining area. As now envisioned, deep-sea mining operations will result in the removal and redistribution of sediments and benthic organisms and, where suction dredging is employed, in the discharge of nutrient-rich, sediment-laden bottom water into the surface layer. Our approach to the problem of the environmental impact of deep-sea mining is based on (1) the establishment of physical, chemical and biological baseline environmental conditions in potential mining areas; (2) documentation of changes induced in benthic and pelagic ecosystems by deep-sea mining; (3) elucidation of their underlying mechanisms and implications in relation to current and potential marine resource; (4) formulation of guidelines for future mining operations which will minimize harmful environmental effects while enhancing the development of potentially beneficial by-products; and (5) determination of the properties which should be monitored during deep-sea mining to provide the information necessary to continuously evaluate the environmental impact of specific mining operations. (See also W76-10600) (Sinha-OEIS)
W76-10602

SAFETY AND POLLUTION CONTROL - OFFSHORE PETROLEUM PRODUCING FACILITIES,
Humble Oil and Refining Co., Houston, Tex.
D. G. Warner.
In: Marine Technology Society Eighth Annual Conference, held in Washington DC, September 11-13, 1972. Preprints, 1972. p 741-752, 9 fig, 8 ref.

Descriptors: *Offshore platforms, *Oil industry, *Oil pollution, Water resources, *Resources development, *Environmental effects, Water quality control, *Pollution abatement, Continental Shelf, Blowouts, Safety, Drilling.
Identifiers: *Outer Continental Shelf, *Offshore technology.

Blowout prevention and pollution control in offshore petroleum operations are of prime concern to industry, regulatory agencies, and the public. This paper reviews safety and antipollution equipment and procedures used in offshore oil production and discusses Humble and Industry programs to achieve maximum protection. Several safety and pollution-control systems are utilized. Surface safety valves and subsurface safety valves in each well provide shut-in if an abnormal condition develops. Oil leaks are retained in sumps. Fire-fighting equipment is installed on each platform to rapidly extinguish small fires before they can spread. The paper concludes that various industry and regulatory programs are providing the safety and pollution control that is needed. Technological developments and reliability improvements are continuing. Ongoing work emphasizes development of subsurface safety valve concepts applicable to all wells, better manufacturing quality control and standards, and further reductions of human errors through training and safety programs. (See also W76-10600) (Sinha-OEIS)
W76-10603

QUALITY OF WATER CONSIDERATIONS IN ARID AREA WATER MANAGEMENT,
Nevada Univ., Reno. Desert Research Inst.; and Nevada Univ., Las Vegas. Center for Water Resources Research.
For primary bibliographic entry see Field 5B.
W76-10608

AGRICULTURAL SEDIMENT CONTROL FOR WATER QUALITY PROTECTION,
Environmental Protection Agency Washington, D. C. Office of Air and Water Programs.
W. C. Shilling.
In: Agriculture and Clean Water--Proceedings of a Conference to Explore Control Strategy for Agricultural Nonpoint Source Water Pollution, Kansas City, Missouri, April 3, 1975, p 19-26.

Descriptors: *Sediments, Agriculture, *Water quality, *Soil conservation, Farm wastes, *Sediment control.
Identifiers: Public Law 92-500.

Briefly discussed are three major areas of agricultural sediment control. They are the (1) impact of agricultural sediments on water quality and the control of these sediments, (2) nonpoint control features of Public Law 92-500, and (3) state and local control programs. The impact of agricultural sediments on water quality generally falls into three categories. First, there are the direct effects of the sediments. These sediments settle to the bottom of some body of water and smother some of the bottom organisms. They reduce penetration of light, thus affecting the photosynthesis processes. They also have an aesthetic effect. Second, the sediments act as carriers of potentially pollutional materials. Third, they place varying oxygen demands on the water body. Animal waste and crop residue that form a part of the sediments in a total sense are organic materials and will utilize oxygen in their decomposition. Different sections of Public Law 92-500 are given in relation to the control of nonpoint sources or agricultural sediments. Local expertise must be involved from the beginning in the planning, development, and implementation of the management programs. Four items deemed important are: (1) if a control program for agricultural sediments is to be effective, it must be tailored to local conditions, (2) priorities must be determined and an effective control program, developed and implemented, (3) a distinction must be made between soil conservation and water quality protection, and (4) 208 planning and 305 (b) state reports preparation are either on-going or being initiated, and those with specific knowledge in the control of agricultural sediments should make their expertise available for these efforts. (Cameron-East Central)
W76-10617

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
J. W. Scotton, K. T. Mullen, J. Whitman, and R. Citron.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 757, $10.75 in paper copy, $3.00 in microfiche. Report EPA-600/4-75-001, December 1974, 384 p. 139 tab.

Descriptors: *Pollutant identification, *Programs, *Monitoring, *Assessments, *Administrative agencies, *Governmental interrelations, Local governments, State governments, Federal government, Air pollution, Water pollution.
Identifiers: Directories.

Federal environmental quality monitoring and assessment programs within the Environmental Protection Agency are described, juxtaposed with corresponding, although not necessarily administratively related, national, state, and local moni-

toring activities. Seven areas are discussed: air, water quality, interstate water carrier supplies, pesticides, radiation, noise, and solid waste. The administration and purpose of the EPA office monitoring each are described. The data in the directly was obtained from EPA. Detailed descriptions of individual monitoring activities were clarified by state and local agencies. This account is not exhaustive, but it provides a first approximation of the types and distribution of monitoring activities. (Snyder-FIRL)
W76-10623

REPORT ON POLLUTION OF INTERSTATE WATERS OF THE CONNECTICUT RIVER.
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W76-10626

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10637

A PRELIMINARY DESIGN FOR A NATIONAL ENVIRONMENTAL CENSUS,
Energy Resources Co., Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-10642

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
H. O. Banks, and L. G. McMillion.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-1-1 - 9-1-4.

Descriptors: *Legal aspects, *Legislation, *Jurisdiction, *Groundwater, *Monitoring, Federal Water Pollution Control Act, Regulation, Water quality, Water pollution.
Identifiers: Safe Drinking Water Act, Federal-interstate compacts.

Legal mandates and requirements pertaining to groundwater quality monitoring are reviewed. The Federal Water Pollution Control Act, as amended by Public Law 92-500, and the Safe Drinking Water Act are pieces of federal legislation which dictate needs for groundwater monitoring. A few interstate compacts, such as the federal-interstate compacts for the Delaware River Basin and the Susquehanna River Basin, provide authority for compact commissions to monitor groundwater quality. State laws and regulations for groundwater monitoring show wide variation, and there are generally several state agencies which have statutorily defined authorities and responsibilities with respect to groundwater. At the regional and local levels of government, counties, municipalities and special political jurisdictions such as water supply, sanitary, flood control, and water conservation districts have interests in groundwater quality and often conduct extensive monitoring programs. (See also W76-10637) (Kreager-FIRL)
W76-10656

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
R. L. Crouch, R. D. Eckert, and D. D. Rugg.
In: International Conference on Environmental Sensing and Assessment, Vol. 1, September 14-19, 1975, Las Vegas, Nevada, p 9-2-1 - 9-2-4. 10 fig, 3 ref.

Descriptors: *Monitoring, *Groundwater, *Cost-benefit analysis, *Optimum development plans, Economics, Evaluation, Costs, Water quality, Water pollution.

Economic considerations associated with selecting an optimal groundwater quality compliance monitoring strategy are discussed. Marginal benefits and marginal damage functions are used to analyze a hypothetical situation involving the contamination of a farmer's irrigation well with chlorides from an oil company's unlined brine disposal pit. The marginal cost curve for compliance monitoring will change as technological innovations in the monitoring industry occur and as the relative prices of various alternative monitoring techniques change. Similarly, the marginal benefit curve will change as the marginal social gain from monitoring changes, and this will change as the polluter's marginal benefits function from emitting pollutants and the pollutee's marginal damage function from the impact of pollutants change. (See also W76-10637) (Kreager-FIRL)
W76-10657

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
O. W. Albrecht.
News of Environmental Research in Cincinnati, November 14, 1975, 4 p, 1 fig, 2 tab, 9 ref.

Descriptors: *Regulation, *Rates, *Recycling, *Transportation, *Discriminatory pricing, Railroads, Chemicals, Iron, Rubber.
Identifiers: Secondary materials.

Two Environmental Protection Agency (EPA) studies did not prove conclusively discrimination by Interstate Commerce Commission (ICC)-regulated rates against secondary materials. A study by the Research Planning Institute (RPI) implied that discrimination, in the ICC sense, might exist for rates for motor carriers weighted by amounts of necessary chemical constituents for paperboard manufacture. The study did not document, however, that the rate differences actually affected long-run decisions involving plant locations and raw material substitutions. The Moshman Associates study compared percentage contributions to variable cost of different rates per ton-mile. To the extent that the costs were representative, the study implied that economic discrimination existed for ferrous scrap because the applicable rates did vary from incremental costs on long hauls compared to iron ore rates. Discrimination was also suggested for cullet and reclaimed rubber because their contribution percentages were higher than those for their new counterparts. Questions have been raised as to whether ICC costing procedures are appropriate. The basic issue of rate discrimination is related to national goals for regulation of common carriers. There are, at present, no clear criteria for freight rates. It is generally inappropriate to determine discrimination on the basis of incremental cost pricing due to the nature of costs prevailing for railroads. New decision rules are needed if regulation of freight rates is to encourage a social goal, such as recycling. Since the EPA analyses, several general rate increases have occurred, and the ICC ordered holddowns for some of these on certain recyclable commodities. (Snyder-FIRL)
W76-10676

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
W. S. Butcher.
Presented at 80th Annual Meeting of the American Institute of Chemical Engineers, September 7-10, 1975, Boston, Massachusetts, 12 p.

Descriptors: *Water treatment, *Water conservation, *Water purification, *Water resources, *Technology, *Research and development, Federal government, Desalination, Impaired water quality, Saline water, Water sources, Water supply.

The Office of Water Resources Research and the Office of Saline Water Conversion were combined in July 1974 to form the Office of Water Research and Technology (OWRT). New functions were added to the old functions incorporated in the new office. The new office's objectives are to develop new knowledge needed to mitigate or solve important water resource problems and to help disseminate research results. The programs to achieve these objectives include research, development, scientific information dissemination, and technology transfer. Problems studied include the hydrologic cycle, water supply and demand, conservation, and methods of increasing water supplies. Research is performed by contractors. Three major areas of research are surface and groundwater treatment technologies; technologies making impaired water usable; and saline water conversion technologies for municipal, agricultural, and industrial uses. A Water Resources Scientific Information Center is included in OWRT. The technology transfer program is still in a formative stage. The OWRT was established to provide a more responsive system relating water research and results to actual problems. (Snyder-FIRL)
W76-10677

ASSESSMENT OF POLYVINYL CHLORIDE AS A PACKAGING MATERIAL FOR DISTILLED SPIRITS, (ENIVRONMENTAL IMPACT ASSESSMENT),
Bureau of Alcohol, Tobacco and Firearms, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10722

AN INTEGRATED INTERNATIONAL AND DOMESTIC APPROACH TO CIVIL LIABILITY FOR VESSEL-SOURCE OIL POLLUTION,
L. D. Wood.
Journal of Maritime Law and Commerce, Vol 7, No 1, p 1-68 (1975). 68 p, 2 fig.

Descriptors: *Oil spills, *Oil pollution, *International law, *Treaties, *Federal Water Pollution Control Act, Pollutants, Water pollution sources, Water pollution effects, Oil industry, Oil, International waters, Navigable waters, United States, Transportation, Ships, Federal jurisdiction, State jurisdiction.
Identifiers: Maritime law, Territorial waters, *Liability, Oil tankers, Vessel-source pollution, Torts.

Presently there are no adequate private law remedies for vessel-source oil pollution damage, either in the United States or abroad. Any potential recovery usually depends on the establishment of a cause of action such as private nuisance or negligence. Even if the plaintiff is able to sustain the difficult burden of proof in such actions, however, recovery may be defeated by a number of common law defenses. To provide an adequate remedy for oil pollution damages, a comprehensive modern plan for dealing with theproblem of liability for vessel-source pollution is set forth in two treaties drafted by the Inter-Governmental Marine Consultative Organization. These treaties would establish a scope of liability and an international compensation fund, supported by a levy on oil transported by sea. The author compares these treaties with existing legal mechanisms, examines various facets of oil pollution damage, and discusses jurisdictional matters relating to both existing and proposed systems, domestic and international. It is urged that Congress ratify the treaties and at the same time enact a program to incorporate their provisions into a comprehensive

domestic program which would create a uniform body of law for oil pollution liability among the states and within the Federal Government. (Sloan-Florida)
W76-10730

THE ROLE OF THE COASTAL ZONE MANAGEMENT ACT OF 1972 IN THE DEVELOPMENT OF OIL AND GAS FROM THE OUTER CONTINENTAL SHELF,
Morgan, Lewis and Bockius, Washington, D. C.
K. A. Rubin.
Natural Resources Lawyer, Vol. 8, No. 3, p. 399-436 (1975). 38 p.

Descriptors: *State jurisdiction, *Federal-state water rights conflicts, *Continental shelf, *Environmental effects, *Oil reservoirs, Oil, Attitudes, Cocial impact, Atlantic Ocean, Oil fields, Fuels, Oil industry, Oceans, Gases, Atlantic coastal plain, Social aspects, Legal aspects, United States, Jurisdiction, Water rights, Legislation, Federal government, Drilling, Federal jurisdiction.
Identifiers: *Coastal Zone Management Act, *Offshore oil, *Outer continental shelf, Gas exploration and development.

Increased importation of oil and gas resulting from the rapid decline of domestic supplies of these resources could be slowed by the exploitation of substantial quantities of oil and gas contained in the Outer Continental Shelf (OCS). This article examines the national interest in prompt exploration and development of the OCS and in the possibility that the Coastal Zone Management Act of 1972 (CZMA) may be used to delay exploratory drilling. The federal government has exclusive jurisdiction over the oil and gas resources of the OCS. Section 307 of the CZMA, however, enlarges the state's authority by requiring federal government activities to be consistent with approved state management programs. To insure that this power is used properly, the CZMA provides three constraints on state authority: (1) the management program must adequately consider the national interests involved; (2) the Secretary of Commerce has within his power the right to permit a license to be issued: and (3) the exercise of state authority must be consistent with the Commerce Clause of the United States Constitution. Also included is a discussion of the national interest in prompt development of the energy resources of the Atlantic OCS. (Griffith-Florida)
W76-10734

ENERGY CRISIS, SUPERTANKERS AND ECOLOGY,
R. C. Morris.
Insurance Counsel Journal, Vol. 42, No. 4, p. 511-25 (1975). 15 p.

Descriptors: *Ships, *Oil spills, *Oil pollution, *Federal jurisdiction, *International law, Insurance, Water pollution, Water pollution sources, Oceans, Harbors, Federal government, State governments, Legislation, Florida, Federal Water Pollution Control Act, Oil spills, Standards, Legal aspects, Governmental interrelations, International commissions, Judicial decisions.
Identifiers: *Supertankers, Absolute liability, Oil Pollution Act, Certification, National Environmental Policy Act, Coastal Zone Management Act, Deepwater oil terminals.

Transcribed here are the remarks of speakers at a forum on the problems of super-tankers in relation to oil pollution. Topics discussed include: the expanding role of supertankers in transporting petroleum; internationa l standards for tanker design, construction and operation; and the legal ramifications of marine pollution. Oil pollution has been dealt with by international conventions, including conventions on Pollution of the Sea by Oil, Civil Liability and Ocean Dumping. The United States has treated oil pollution problems by ratifying several international conventions and by passing federal legislation such as the Oil Pollution Act, National Environmental Policy Act, Coastal Zone Management Act and the Deepwater Port Act. One speaker discussed a Florida law, upheld by the Supreme Court, which imposed absolute liability on a shipowner for oil spills. He concluded that federal legislation preempting state laws was necessary to allow uniformity in marine pollution law. Another speaker covered the problems of insuring for oil pollution liability with special emphasis on problems caused by a lack of uniformity of laws between states and between nations. (Capehart-Florida)
W76-10735

WATER QUALITY AND THE WATER AND SOIL CONSERVATION ACT 1967,
D. A. R. Williams.
The New Zealand Law Journal, Vol. 1975, p. 650-62, 13p.

Descriptors: *Water conservation, *Water pollution control, *Classification, *Water quality control, *Foreign countries, Vegetation, Administrative agencies, Legal aspects, Administration, Conservation, Governments, Water quality, Legal review, Water pollution, Treatment, Supply, Water policy, Water rights, Regulation, Water resources development, Waste water treatment, Jurisdiction, Water law.
Identifiers: *New Zealand, *Water and Soil Conservation Act 1967(NZ).

The growing demand for water coupled with serious water quality problems has prompted New Zealand to undertake sweeping water law changes. This article analyzes the effects of the Water and Soil Conservation Act of 1967. The Act completely replaces common law riparian rights with statutory rights. It governs all 'natural water' which is defined to include substantially all water within territorial limits. A classification system establishes minimum quality standards for all affected water. Because the Act is so all-encompassing and so new, the application of statute to facts is still evolving. Nevertheless, some general principles have been set forth by the administrative board responsible for enforcement. With regard to classifications, the board has decided that the highest practical standards should be used for low quality water and that high quality water should not be impaired. Use of water is a matter of permit and the board has decided to weigh each case rather than establish rules. Standing to sue and to appeal are subjects as yet unresolved. (Comer-Florida)
W76-10737

BURNING WATERS,
H. L. Markow.
The Florida Bar Journal, Vol. 50, No. 1, p. 20-23 (1976). 4 p, 3 photo.

Descriptors: *Penalties(Legal), *Water pollution control, *Oil spills, Oily water, *Coast Guard regulations, State jurisdiction, Federal jurisdiction, Law enforcement, Disasters, River regulation, Legislation, Judicial decisions, Water pollution sources, Oil pollution, Oil wastes, Oil industry, Ships.
Identifiers: *Oil Pollution Act, *FWPCA Amendments of 1972, Water rights(Non-riparians), Absolute liability.

Burning water is an ever present danger of oil pollution. From 1952 to 1969 at least three major holocausts occurred in inland waters of this nation. This article focuses on the means by which the danger of burning waters has been reduced since 1970. Federal and state legislation require equipment usage to reduce spills and impose liability for pollution damage. The Coast Guard engages in constant surveillance with modern equipment and National Strike Force Teams are available for immediate response to any oil spillage. Reporting requirements have been strictly enforced by courts with resulting liability for violators. In some cases, private parties have been allowed to sue pollutors for damages. However, cleanup costs and legislatively imposed penalties will not prevent oil fires once pollution has occurred. The author examines the court imposed reporting standard of 'if you can see it, report it', and concludes that until oil spills are reduced to non-combustible limits, private reporting is the best safeguard to prevent oil spills from turning into holocausts. (Comer-Florida)
W76-10740

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10741

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 6E.
W76-10742

U. S. POSITION ON LAW OF THE SEA REVIEWED,
For primary bibliographic entry see Field 6E.
W76-10743

HERE COME DE SLUDGE,
For primary bibliographic entry see Field 6E.
W76-10746

THE GREAT MAINE LOBSTER WAR,
For primary bibliographic entry see Field 6E.
W76-10747

THE NEW TREATY ON VESSEL POLLUTION,
For primary bibliographic entry see Field 6E.
W76-10748

LAWYERS AND ECOMANAGEMENT,
Puerto Rico Univ., Mayaguez. Inst. for Policy Studies and Law.
For primary bibliographic entry see Field 6E.
W76-10753

MATERIALS TRANSPORTATION BUREAU: TRANSPIRATION OF NATURAL AND OTHER GAS BY PIPELINE,
C. DeLeon.
Federal Register, Vol. 40, No. 191, p. 45192-97, October 1, 1975. 6 p.

Descriptors: *Offshore platforms, *Pipelines, *Natural gas, *Safety, *Transportation, Pollutants, Safety factors, Environmental engineering, Water pollution, Pollution abatement, Natural resources, Oil industry, Regulation, Coastal structures, Mechanical engineering, Public health, Legislation, Water law, Pressure conduits.
Identifiers: *Coastal waters, Administrative regulations.

The safety standards in Part 192 of Title 49 govern the design, construction, operation and maintenance of gas pipeline facilities and the transportation of gas in or affecting interstate or foreign commerce. These safety standards apply to gas pipeline facilities and the transportation of gas onshore as well as on the 'lands beneath navigable waters' and on the 'outer continental shelf' as those terms are defined in the Submerged Lands Act and the Outer Continental Shelf Lands Act. In view of the increasing development of offshore natural gas resources, the Materials Transportation Bureau (MTB) is considering amending Part

192 more clearly to delineate the applicability of Part 192 to offshore pipelines as well as to enhance the level of safety of gas pipeline facilities and in the transportation of gas offshore. (Reinders-Florida)
W76-10756

NEW SOURCE NPDES PERMITS PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10757

SOAP AND DETERGENT MANUFACTURING CATEGORY PRETREATMENT STANDARDS FOR NEW SOURCES,
Environmental Protection Agency, Washington, D. C.
J. Quarles.
Federal Register, Vol. 40, No. 126, p. 27454-56, June 30, 1975. 3 p. 7 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Detergents, Standards, *Federal Water Pollution Control Act, Water pollution sources, Chemical wastes, Water pollution, Water law, Water policy, *Water quality standards, Administration, Regulation, Control, Water quality, Legislation, Management, Water pollution treatment, Treatment facilities.
Identifiers: *FWPCA Amendments of 1972, *Point sources(Pollution), Administrative regulations, Hazardous substances, Effluent limitations, Environmental Protection Agency(EPA).

The Environmental Protection Agency (EPA) has promulgated final pretreatment standards for new sources for the manufacture of spray dried detergents, liquid detergents, drum dried detergents, and the manufacture of detergents by dry blending subcategories which discharge to publically owned treatment works. This final rulemaking is promulgated pursuant to section 307(c) of the Federal Water Pollution Control Act as amended. Set forth in the regulation are the numerical limitations which constitute the pretreatment standards for the appropriate subcategories. Presented within the notice are: (1) a summary of comments received by the EPA; (2) the revisions of the proposed regulations made prior to promulgation; and (3) the final rulemaking. (Reinders-Florida)
W76-10759

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY, PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol. 40, No. 106, p. 23829-30, June 2, 1975. 2 p.

Descriptors: *Effluents, *Sewage effluents, *Classification, *Industrial wastes, *Waste water disposal, Treatment facilities, Cities, Waste treatment, Water treatment, Water pollution sources, Liquid wastes, Decision making, Pollutants, Wastes, Water pollution sources, Discharge(Water), Water pollution.
Identifiers: Administrative regulation, *FWPCA Amendments of 1972, Effluent limitations.

The Environmental Protection Agency (EPA) has proposed standards for pollutants introduced into publicly owned treatment works. The EPA believes the analysis supporting the effluent limitations guidelines is adequate to make a determination regarding the application of those standards to users of publicly owned treatment works; but to insure that these standards are appropriate in all cases, the EPA is seeking additional comments. Set forth are proposed effluent limitations guidelines and pretreatment standards for the introduction of incompatible pollutants into municipal systems by existing sources in the wood furniture and fixture production without water wash spray booth(s) or laundry facilities, and the wood furniture and fixture production with water wash spray booth(s) or with laundry facilities subcategories. The Agency has three options: (1) allow unrestricted discharge of materials known to be adequately treated (compatible pollutants); (2) require application of best practicable control technology based (1977) limitations to those pollutants which interfere with, pass through, or otherwise are incompatible with such works; or (3) establish a different discharge limitation for those pollutants treated to a known degree in publically owned treatment works where treatment is relatively inadequate. Pollutant categories and proposed pretreatment standards are presented. (Reinders-Florida)
W76-10760

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol 40, No 106, p 23824-28, June 2, 1975. 5 p.

Descriptors: *Federal Water Pollution Control Act, *Waste water treatment, *Water quality standards, *Industrial wastes, Water pollution sources, Administrative decisions, Waste water disposal, Effluents, Industrial plants, Treatment facilities, Water pollution, Discharge(Water), Pollution abatement, Water pollution control, Federal government, Control, Regulation, Water law, Environmental effects, Cost-benefit analysis, Economics, Water policy.
Identifiers: Administrative regulations, *FWPCA Amendments of 1972, Effluent limitations, *Point sources(Pollution).

The Environmental Protection Agency (EPA) has established final effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the timber products processing category of point sources. This category is amended by the addition of the wood furniture and fixture production without water wash spray booth(s) or laundry facilities sub-category, and the wood furniture and fixture production with water wash spray booth(s) or with laundry facilities subcategory. The EPA's final rulemaking is promulgated pursuant to the Federal Water Pollution Control Act Amendments of 1972. Included within the notice are: (1) a summary of comments received by the Environmental Protection Agency; (2) the revisions of the proposed regulations made prior to promulgation; (3) the projected economic impact of compliance for these industry sectors; (4) a cost-benefit analysis; (5) publication references; and (6) the final amendments. (Reinders-Florida)
W76-10761

ENVIRONMENTAL PROTECTION AGENCY: POLICIES AND PROCEDURES FOR STATE CONTINUING PLANNING PROCESS,
Environmental Protection Agency, Washington, D. C.
R. F. Train.
Federal Register, Vol. 40, No. 137, p. 29882-87, July 16, 1975. 6 p.

Descriptors: *Planning, *Governmental interrelations, *Comprehensive planning, *Water allocation(Policy), *Water resources development, Management, Programs, Water management(Applied), Coordination, Decision making, Governments, Forecasting, Long-term planning, Projections, Administration, Budgeting, State governments, Future planning(Projected), Legislation.
Identifiers: Administrative regulations.

The Environmental Protection Agency has proposed regulations prescribing and providing procedures for review, revision, and approval of a State's continuing planning process. In addition, these regulations provide the mechanism for states to satisfy the Statewide requirements of Section 208 of 40 CFR Part 130 as well as portions of the following sections: Section 303(d) concerning critical waters and total maximum daily loads; Section 305(b) concerning annual assessment and projection of water quality and related information, including nonpoint sources; Section 314(a) concerning clean lakes; and Section 516(b) concerning Federal and State estimates of publicly owned treatment works construction needs. The broad goals of the continuing planning process are: (1) to assure that states develop the water quality assessment expertise and establish the management programs necessary to make coordinated water quality management decisions; (2) to establish water quality objectives which take into account overall Federal, state, and local policies and programs, including those for land use and other related natural resources; and (3) to develop the strategic guidance for preparing the annual State program submittal under Section 106 of the Act. (Reinders-Florida)
W76-10762

PREPARATION OF STATE WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol. 40, No. 137, p. 29887-91, July 16, 1975. 5 p.

Descriptors: *Federal Water Pollution Control Act, Water quality, *Environmental effects, *Water quality standards, *Project planning, Environment, Federal government, Legislation, State governments, Governments, Administrative agencies, Governmental interrelations, Political aspects, Water law, Water policy, Water pollution, Water resources, Water control, Environmental control, Programs, Regulation.
Identifiers: *State Water Quality Management Plan, *FWPCA Amendments of 1972.

The Environmental Protection Agency (EPA) has proposed an amendment to 40 CFR Part 131 which would alter requirements for state preparation of Water Quality Management Basin Plans. The amendment would change procedures governing plan adoption, submission, revision, and EPA approval. It also includes provisions for statewide planning responsibility under Section 208 of the Act. The primary objective of State Water Quality Management Programs is to achieve the 1983 'National water quality' goal of the Act by establishing attainable water quality goals. This means identifying necessary control and regulatory programs and determining the resulting environmental, social and economic impact. Each plan would include: planning boundaries; water quality assessment and segment classifications; inventories and projections; non-point source assessment; water quality standards; total maximum daily loads; point source land allocation; municipal facility needs; industrial facility needs; non-point source control needs; residual waste control needs; and urban and industrial stormwater needs. (Hadoulias-Florida)
W76-10763

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA SUBCATEGORY,
Environmental Protection Agency, Washington, D. C.
J. Quarles.
Federal Register, Vol. 40, No. 162, p. 36337-39, August 20, 1975. 3 p, 2 tab.

Descriptors: *Federal Water Pollution Control Act, *Ureas, *Nitrogen compounds, *Ammonium compounds, *Regulation, Administrative agencies, Water pollution sources, Industrial wastes,

Water pollution control, Water pollution treatment, Fertilizers, Classification, Pollution abatement, Administrative decisions.
Identifiers: *FWPCA Amendments of 1972, Administrative regulation.

As a result of comment received and continued evaluation and review the Environmental Protection Agency has revised its proposed amendment to the Fertilizer Manufacturing Point Source Category, Urea Subcategory effluent limitation and guidelines regulation. The revision limits application of the regulation to prilled urea plants in which production began after January 1, 1970. The average daily values for thirty consecutive days for organic nitrogen has been increased to the highest monthly average of thirty-five months of exemplary plant operation. The maximum organic nitrogen for any day has been increased to 99% of the average daily values. Limitations for urea plants other than prilled urea have been suspended for reconsideration. Additional data and information evaluation and analysis is contemplated for development of limitations for older plants. The 1983 limitations are expected to be reconsidered after industry evaluation. The revision is promulgated in final form effective September 1975. (Comer-Florida)
W76-10764

ENVIRONMENTAL PROTECTION AGENCY: GRANTS AND OTHER FEDERAL ASSISTANCE, STATE AND LOCAL ASSISTANCE.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol. 40, No. 230, p. 55321-26, p. 55334-42, November 28, 1975. 15 p.

Descriptors: *Administrative agencies, *Grants, Governmental interrelations, *Federal project policy, *Project planning, Cost allocation, Cost sharing, Cost repayment, Project purposes, Water policy, Water quality control, State governments, Federal government.
Identifiers: Administrative regulations, *FWPCA Amendments of 1972.

Consistent with the Federal Water Pollution Control Act Amendments of 1972 the Environmental Protection Agency (EPA) has promulgated rules governing the policies and procedures for establishment and funding of state and regional continuing planning processes. The regulations require the designation of approved state and areawide planning agencies and the development of state water quality management plans. Relationships between the planning process and other programs, including municipal facilities programs, federal, state and local planning programs, federal properties programs and the National Pollutant Discharge Elimination System, are specified. The regulations also specify requirements for state planning process adoption, approval and revision procedures. The planning process must become self sufficient; however, in the initial stages planning will be eligible for federal grants. A ratio of allotment set forth for state and areawide fund allocation governs payment formulation. Requirements for grant eligibility are specified. (Comer-Florida)
W76-10765

DEEPWATER PORT SITE EVALUATION,
Coast Guard, Washington, D.C.
D. J. Riley.
Federal Register, Vol. 40, No. 217, p. 52581-82, November 10, 1975. 2 p.

Descriptors: *Coast Guard regulations, *Offshore platforms, *Coastal structures, *Administrative agencies, *Permits, Navigation, Coastal engineering, Port authorities, Construction, Rivers, Sites, Ships, Oil.
Identifiers: *Administrative regulations, Coastal waters, Navigation obstructions.

Under the provisions of the Deepwater Port Act of 1974 the Coast Guard has proposed an amendment to the deepwater port regulations. This amendment adds requirements to activities relating to site evaluation and preconstruction testing at potential deepwater port locations. Persons subject to the amendment must submit an application for authorization to conduct site evaluation and preconstruction testing. The application must include: the identification of persons or agencies participating; the type of activity and manner of conduct; location of the activity and locations of offshore structures, pipelines or cables in or around the area; the specific purpose; the proposed commencement and completion dates: environmental data including consequences of the proposed activity; and a report on the historic and archeological significance of the area. The Coast Guard may limit authorization terms and conditions. No activity may be conducted except in compliance with authorization terms. Suspension or revocation of authorization may result if environmental damage threatens or if there is any violation of laws, regulations or authorization conditions. (Comer-Florida)
W76-10766

DEEPWATER PORTS: LICENSING PROCEDURES AND DESIGN CONSTRUCTION, EQUIPMENT AND OPERATIONS,
Coast Guard, Washington, D.C.
O. W. Siler.
Federal Register, Vol. 40, No. 217, p. 52540-80, November 10, 1975. 41 p.

Descriptors: *Construction, *Offshore platforms, *Coastal structures, *Permits, *Administrative agencies, Regulation, Navigation, Coast Guard regulations, Coastal engineering, Specification, Design standards, Materials, Building codes, Federal government, Port authorities.

Pursuant to the Deepwater Port Act of 1974 the Coast Guard has promulgated regulations governing the licensing, design, construction, equipment and operation of deepwater ports beyond the territorial sea of the United States. The licensing procedure requires the applicant to identify himself and his affiliates, to describe their design, financial and technical backgrounds, and to show compliance with all applicable laws and regulations. Both formal and informal hearings are provided in the specified licencing procedures. Licensing is for a maximum twenty year term. Exemption from any regulation requirement is available upon specified factual determinations. Design, construction and equipment of parts must meet certain standards. Areas of applicability include safety equipment, pollution prevention equipment and navigational aids. Regulations governing operation of ports include personnel requirements, vessel navigation safety precautions, oil transfer controls and general maintenance and safety requirements. Required reports and records are specified. (Comer-Florida)
W76-10767

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS FOR NEW SOURCES FOR THE PHOSPHATE SUBCATEGORY,
Environmental Protection Agency, Washington, D.C.
R. F. Train.
Federal Register, Vol. 40, No. 152, p. 33052-54, August 6, 1975. 3 p, 3 tab.

Descriptors: *Industrial effluents, *Phosphates, *Fertilizers, *Water pollution sources, *Discharge(Water), Administrative agencies, Decision making, Environmental effects, Impoundments, Rainfall disposition, Water management(Applied), Waste water(Pollution), Industrial wastes, Effluents, Industrial water, Water policy, Water law, Water quality, Administrative decisions.
Identifiers: Effluent limitations, *FWPCA Amendments of 1972, Administrative regulations.

Pursuant to the authority of the Federal Water Pollution Control Act, notice is given that the Environmental Protection Agency (EPA) has proposed to amend Subpart A of the Phosphate Subcategory. After due consideration of phosphate fertilizer manufacturers' claims, the EPA believes that the allowance for discharge from a water impoundment due to rainfall events can be restated so as to make its application less cumbersome and more easily understood. Additionally, the EPA concurs that in some situations it may be appropriate to allow some discharge from the facility due to leaks and spills which are otherwise unavoidable. The agency believes, however, that any allowance for such discharge must require prompt management attention to and correction of the leaks and spills. The amount of pollutants discharged by facilities affected by this subpart should not be substantially altered by this change in regulatory language, nor is there likelihood of any significant effect on the energy necessary for pollution control or any other non-water quality related environmental impacts. (Reinders-Florida)
W76-10768

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, ETHYLENE OXIDE, ETHYLENE GLYCOL, METHYL AMINES AND OXO CHEMICALS PROCESSES,
Environmental Protection Agency, Washington, D.C.
R. F. Train.
Federal Register, Vol 40, No 159, p 34409-17, August 15, 1975. 9 p, 17 tab.

Descriptors: *Chemical industry, *Water quality standards, *Waste water treatment, *Industrial wastes, Water quality, Effluents, Administrative agencies, Federal Water Pollution Control Act, Chemical wastes, Chemical oxygen demand, Biochemical oxygen demand, Regulation, Standards, Water pollution sources, Federal government, Pollutants, Water pollution control.
Identifiers: *Administrative regulations.

The Environmental Protection Agency has proposed amended guidelines for limitations on discharges in the organic chemical manufacturing point source category. Included in the proposed regulation are the ethylene oxide, methyl amines, ethylene glycol and oxo chemicals manufacturing processes. Reconsideration of the four product/processes was required by the Fourth Circuit Court of Appeals following petitions filed for review by corporations in the chemical industry. The corporations submitted data to be used in formulating the guidelines. The degree of effluent reduction required for the discharge of BOD5, TSS and pH by the four processes is specified. The ethylene oxide and methyl amines processes also require reduction of COD. The standards of performance required for discharge by new sources are similarly specified. (Capehart-Florida)
W76-10769

OIL POLLUTION PREVENTION,
Environmental Protection Agency, Washington, D.C.
R. L. Baum.
Federal Register, Vol. 40, No. 132, p. 28849, July 9, 1975. 1 p.

Descriptors: *Federal Water Pollution Control Act, *Oil spills, *Environmental effects, *Costs, *Storage tanks, Environment, Pollution, Legislation, Legal aspects, Federal government, Regulation, Administration, Remedies, Pollutants, Water pollution, Water pollution sources, Oil, Penalties(Legal), Planning, Environmental control, Oil pollution, Ships.
Identifiers: *Spill Prevention Control and Countermeasure Plan, Non-petroleum oil.

Section 311 of the Federal Water Pollution Control Act (FWPCA) requires owners or operators of any vessel, onshore facility, or offshore facility from which oil is discharged in harmful quantities into or upon the navigable waters of the United States to notify the appropriate agency of such discharge, and to suffer the removal costs of any discharged oil in addition to appropriate civil or criminal penalties. Furthermore, the Environmental Protection Agency (EPA) requires those owners or operators having oil storages over certain capacities and who may reasonably be expected to discharge oil in harmful quantities, to prepare for certification a Spill Prevention Control and Countermeasure (SPCC) Plan. Given the objectives of the FWPCA, the EPA is giving notice that section 101(a) will be interpreted to include owners and operators of facilities storing or using fat and oils from animal and vegetable sources. Consequently, all facilities processing and storing non-petroleum oils in violation of section 101(a) will be subject to EPA enforcement actions and civil penalties if certified plans or requests for extensions are not immediately implemented. (Hadoulias-Florida)
W76-10772

INK FORMULATING POINT SOURCE CATEGORY, PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 40, No 145, p 31730-31, July 28, 1975. 2 p.

Descriptors: *Water quality standards, *Water pollution sources, *Chemical wastes, *Oily water, *Regulation, Administrative agencies, Water purification, Water quality control, Federal Water Pollution Control Act, Waste treatment, Effluents, Waste dilution, Classification, Administrative decisions.
Identifiers: *FWPCA Amendments of 1972, *Point sources(Pollution), Administrative regulations.

Pursuant to the Federal Water Pollution Control Act, the Environmental Protection Agency has proposed a regulation applicable to existing sources in the Ink Formulating point source category. The proposal governs pretreatment standards and requires that an existing source within the oil-base solvent wash ink subcategory may not discharge process water pollutants to a publicly owned treatment works. The regulation does not treat discharges of pollutants into navigable waters. The Environmental Protection Agency intends that the proposal will complement the general regulation for pretreatment standards for existing point sources. The basis of the standard proposed is the best practicable control technology currently available. (Comer-Florida)
W76-10774

ENVIRONMENTAL IMPROVEMENT AUTHORITIES ACT OF 1969 (FORMATION OF PUBLIC CORPORATIONS TO DEAL WITH POLLUTION),
For primary bibliographic entry see Field 6E.
W76-10777

STATE WATER CONTROL BOARD--AUTHORITY TO INVESTIGATE ALL PROBLEMS CONCERNED WITH THE QUALITY OF WATER,
For primary bibliographic entry see Field 6E.
W76-10779

POLLUTION--ASSEMBLY BILL 128--TO CREATE A SYSTEM OF STATE DISCHARGE PERMITS CONGRUENT WITH NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
For primary bibliographic entry see Field 6E.
W76-10780

WATER POLLUTION--CIVIL REMEDIES.
For primary bibliographic entry see Field 6E.
W76-10782

NATURAL RESOURCES, DEPT OF; NUISANCES: WATER.
For primary bibliographic entry see Field 6E.
W76-10783

NATURAL RESOURCES, DEPT OF; NAVIGABLE WATERS.
For primary bibliographic entry see Field 6E.
W76-10786

NORTH DAKOTA WATER QUALITY STANDARDS FOR THE SURFACE WATERS OF NORTH DAKOTA.
For primary bibliographic entry see Field 6E.
W76-10788

VILLAGE SAFE WATER ACT.
For primary bibliographic entry see Field 6E.
W76-10790

WATER MANAGEMENT DISTRICTS--WATER RESOURCES--AUTHORITY TO CONSIDER AND PROTECT AGAINST DEGRADATION OF WATER QUALITY THROUGH PERMITTING PROCESSES.
For primary bibliographic entry see Field 6E.
W76-10791

EI DU PONT DE NEMOURS AND COMPANY V TRAIN (FEDERAL WATER POLLUTION PREVENTION AND CONTROL ACT QUALITY STANDARDS OF WATER AND EFFLUENT DISCHARGED INTO THAT WATER).
For primary bibliographic entry see Field 6E.
W76-10799

PEOPLE EX REL YOUNGER V SUPERIOR COURT (DAMAGE ASSESSMENT TO PUBLIC ENTITY CONSTITUTIONAL BECAUSE NOT PUNITIVE).
For primary bibliographic entry see Field 6E.
W76-10800

SAN FRANCISCO CIVIL SERVICE ASS'N, LOCAL 400 V STATE EX REL REGIONAL WATER QUALITY CONTROL BOARD (DAMAGES ASSESSMENT FOR POLLUTANTS TO PUBLIC ENTITY CONSTITUTIONAL).
For primary bibliographic entry see Field 6E.
W76-10801

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10825

FISH AND WILDLIFE IMPLICATIONS OF UPPER MISSOURI BASIN WATER ALLOCATION, A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10826

AN INVESTIGATION OF EFFLUENT CONTROL STANDARDS AND PRACTICES (ATOMIC ENERGY PRODUCTION),
Douglas United Nuclear, Inc., Richland, Washington.
J. W. Loe.
Available from the National Technical Information Service, Springfield, Va 22161, as DUN 3155, $4.50 in paper copy, $3.00 in microfiche. Document No. DUN-3155, September 1967. p. 1-65 p, 10 fig, 9 tab, 8 append.

Descriptors: *Columbia River, *Water pollution control, *Sewage effluents, *Industrial wastes, *Chemical wastes, Radioactive wastes, Evaluation, Quality control, Investigations, Inspection, Sampling, Testing procedures, Federal government, Rivers, Ponds, Settling basins, Water treatment, *Water quality standards.
Identifiers: *Effluent limitations.

Recent emphasis on air and water quality standards for federal facilities led Douglas United Nuclear, Inc. to investigate and analyze chemical discharges to three hundred area lagoons. Navigable waters pollution was measured after a comprehensive sampling survey of the Columbia River. Based on standards used the study showed that chemical and sanitary effluent release does not contribute a significant amount of pollution to nearby waters. The standards applied were those of Executive Orders 11282 and 11288, Proposed Washington State Quality Standards for Interstate and Coastal Waters, Tentative Stanford Air Quality Guide, and RL Manual Appendix 0510. Along with measuring chemical and sanitary wastes released to process ponds and septic tanks, the study produced data indicating that no significant chemical pollution would occur in the event of an accidental rupture of liquid chemical storage facilities. In addition, no significant amount of contaminated wastes was shown to have been discharged into process ponds. Certain chemicals are listed, however, which are routinely discharged into process ponds and which eventually reach the river through seepage. (Comer-Florida)
W76-10828

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402 Price $3.25. EPA Report Number EPA-440/1-74-004-a, January, 1974, 319 p. 68 fig, 41 tab, 257 ref.

Descriptors: *Effluent, *Waste water disposal, *Regulation, *Feed lots, *Livestock, *Poultry, *Farm wastes, Federal Water Pollution Control Act, *Water quality standards, Bibliographies, Performance, Water pollution sources.

Findings are presented of an extensive study of the feedlot industry for the purpose of developing proposed regulations, providing guidelines for effluent limitations and Federal standards of performance for the industry to implement sections 304 and 306 of the Federal Water Pollution Control Act Amendments of 1972. Feedlots for the following animal types were considered: beef cattle, dairy cattle, swine, chickens, turkeys, sheep, ducks and horses. Guidelines are set forth for effluent reduction attainable through the application of the 'Best Practicable Control Technology Currently Available,' the 'Best Available Technology Economically Achievable' and for New Source Performance Standards. The proposed recommendations require no discharge of process wastewaters to navigable water bodies by July 1, 1977 except for precipitation event(s) in excess of the 10 year, 24 hour storm for the location of the point source for all animal types except ducks. Duck growing operations will be required to meet a limitation on BOD and bacterial pollutants using biological treatment (e.g. 2.0 pounds of BOD per 1000 ducks). By 1983, the no discharge limitation will apply to all animal types except for precipitation event(s) in excess of the 25 year, 24 hour rain-

fall. The latter limitation also applies to all new sources. Supportive data and rationale for development of the proposed guidelines for effluent limitations are presented. (East Central)
W76-10829

LONG-TERM STABILITY OF WASTE LIGNINS IN AQUATIC SYSTEMS. PART 2. STABILITY IN SALINE WATER,
Swedish Water and Air Pollution Research Laboratory, Stockholm, Sweden.
For primary bibliographic entry see Field 5B.
W76-10838

REASONS FOR HAVING THE IVL-INSTITUTE FOR WATER AND AIR POLLUTION CONTROL RESEARCH. (VARFOR ETT IVL-INSTITUT FOR VATTEN- OCH LUFTVARDSFORSKNING.),
I. Eidem.
Svensk Papperstidning, Vol. 79, No. 5, p 143-145, March 25, 1976. 1 tab. (English summary).

Descriptors: *Research facilities, *Water pollution control, *Air pollution, Foreign research, Foreign countries, Europe, Capital costs, Estimated costs, Treatment facilities.
Identifiers: *Sweden.

The Swedish Water and Air Pollution Research Laboratory (IVL) was established in February 1966. Since then, Swedish industries have spent about 3 billion Swedish crowns on external environment-protection measures, resulting in marked pollution abatement. Additional investments of about 3.5 billion Swedish crowns during 1975-1980 are deemed necessary be a Swedish state commission. Thereafter, the Swedish industry must reckon with an annual investment of 2.5 billion Swedish crowns (at the 1974 price level), which is more than 2% of the estimated value of all goods manufactured in 1980. An annual investment of 5 billion Swedish crowns would be needed for the industry to meet all of society's demands. (Brown-IPC)
W76-10853

TOUGH ILLINOIS EFFLUENT STANDARDS ARE MET BY CELOTEX BOXBOARD MILL,
K. E. Lowe.
Pulp and Paper, Vol. 50, No. 3, p 106-109, March, 1976. 6 fig.

Descriptors: *Illinois, *Pulp wastes, *Treatment facilities, *Waste water treatment, Activated sludge, Filtration, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, *Water pollution control, Water purification, Tertiary treatment, Biochemical oxygen demand, Suspended solids, Equipment, Sewage treatment, *Water quality standards.
Identifiers: Boxboard mills, Board mills.

The secondary activated-sludge process and tertiary filtration effluent treatment systems installed at the boxboard mill of Celotex (division of Jim Walter Corp.), Quincy, Illinois, are described. The secondary system is a contact-activated sludge process, designed to reduce BOD by 90% with a 12-hr retention time. The overflow from the secondary clarifier is filtered through a deep-bed filtration system to remove the last traces of suspended solids, which are primarily composed of the hard-to-settle portions of activated sludge. Equipment utilized in the system is described. (Sykes-IPC)
W76-10856

NEW BOILER WATER CHEMICAL TREATMENT REDUCES CORROSION AND SCALE BUILDUP.
For primary bibliographic entry see Field 3E.
W76-10859

SEQUENTIAL CHLORINATION -- IMPACT ON THE ENVIRONMENT,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y.
For primary bibliographic entry see Field 5D.
W76-10860

ENVIRONMENTAL AND SOCIAL FACTORS (IN THE PAPER INDUSTRY),
Crown Zellerbach Corporation, Camas, Wash.
H. R. Amberg.
Tappi, Vol. 59, No. 4, p 68-71, April, 1976. 1 fig, 5 ref, 4 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, *Air pollution, *Pollution abatement, Environment, Regulation, Capital, Economics, Technology, Economic impact, Social impact, *Pulp wastes.

Environmental demands upon the U. S. pulp and paper industry have increased to the point where the industry is now spending about 30% of its capital on pollution control facilities, and those demands are expected to continue through 1983. Present regulatory requirements, many of which will not achieve measurable environmental improvements but will actually have an adverse effect upon the overall environment, can also be expected to have a profound impact upon future technology and technological trends. Large amounts of capital are being mandated for these nonproductive facilities, leaving little capital for the development of much needed new technology. Present environmental regulations based upon the availability of technology regardless of environmental needs are acting as a deterrent to the development of effective problem-oriented technology. There is a need today for the development of more cost-effect controls as well as a major change in regulatory philosophy that will permit the development of site-specific controls designed to resolve environmental problems rather than the mere implementation technology regardless of environmental needs. (Sykes-IPC)
W76-10861

THE COST OF COMPLYING WITH FEDERAL WATER POLLUTION LAW.
Industrial Water Engineering, Vol. 12, No. 6, p 6-9, December 1975/January 1976. 2 tab.

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Costs, Pulp and paper industry, Oil industry, Chemical industry, Heavy metals, Legislation, Water quality act, Water pollution, Water pollution sources, Wastes, Industrial wastes.

The impact of the 1972 Amendments to the Water Pollution Control Act on the annual water pollution control costs in the paper, chemicals, petroleum, and primary metals industries is discussed. (Witt-IPC)
W76-10872

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-10879

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

INCIDENCE DE LA CHARGE POLLUANTE DES EAUX SUR LE COMPORTEMENT DES RADIONUCLEIDES, (EFFECT OF THE POLLUTANT BURDEN OF WATER ON THE BEHAVIOUR OF RADIONUCLIDES),
CEA Centre d'Etudes Nucleaires de Fontenay-aux-Roses (France).
For primary bibliographic entry see Field 5C.
W76-10893

OIL PORTS ON THE CONTINENTAL SHELF,
Exxon Research and Engineering Co., Florham Park, N. J.
J. F. Flory.
Oceanus, Vol. 19, No. 1, p. 45-55, 1975. 14 fig.

Descriptors: *Oil, *Harbors, *Deep water, *Safety factors, Import, Ships, Design, Offshore platforms, Buoys, Oil pollution, Oil spills, Environmental effects, Continental shelf.
Identifiers: *Deep water ports, Moorings, Single point moorings, Tankers.

In order to handle increasing oil imports, very large tankers and offshore ports are the best solution for carrying large quantities of oil safely, economically, and with minimal environmental damage. Multiple-buoy berths and sea islands are not practical in exposed sea locations, thus the installation of single point moorings is a widely adopted method of accommodating large carriers. Terminal operations cause less than 1.5% of all petroleum pollution in oceans and all tanker activities result in less than 30% of the pollution, which is from non-LOT (load-on-top) sources; LOT, when oil tank washings are retained inside the vessel, as practices on most very large crude carriers (VLCC). Nevertheless, tanker and terminal operations do contribute to ocean pollution. Coast Guard estimates indicate that VLCCs used in conjunction with deepwater ports would reduce both the number and the volume of oil spills by a factor of 10 as compared with transhipping. The development, design and world-wide installations of single point moorings--the Catenary Anchor Leg Mooring, the Single Anchor Leg Mooring--are described. Regulations are being promulgated for design, construction, and operation of deepwater ports and several are being planned in the United States. (Auen-Wisconsin)
W76-10984

'WARE THE WADDEN SEA,
Foundation for Applied Ecology, Edam (Netherlands).
For primary bibliographic entry see Field 6G.
W76-10985

HEAT EXCHANGERS FOR USE IN THE CULTURING OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. E. Huguenin.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 147-157. 1 tab., 15 ref. NOAA SG04-4-158-5.

Descriptors: *Hydroponics, *Heat exchangers, *Marine microorganisms, *Laboratory tests, Temperature control, Sea water, Design, *Aquiculture.
Identifiers: Sea food farming.

Seawater temperature control in flowing culture systems is often required in marine biological research. Cross-leakage can damage mechanical systems and harm culture organisms, and sea water can develop superheated levels of dissolved gasses during heating. Several heat exchanger materials and designs have been developed that are compatible to seawater, such as impervious carbon, glass coils, modular glass shells, teflon, titanium, and tube heat exchanger units. Electrical quartz immersion heaters with thermostats can be used, but the high voltages required present a safety hazard. Electrical, over-the-side heating

units sometimes have carbon and titanium outer surfaces. Titanium is biologically inert, but stainless steel leaches chromium and pits. A household cast iron radiator painted with a thin layer of epoxy paint may be adequate. A heat exchanger can be made from glass tubing, plastic pipe, and flexible hose. Polyvinyl chloride tubing, polyethylene tubing, and a chlorinated polyvinyl chloride heat exchanger have also been used. Practical heat exchangers for large scale aquaculture applications are needed. A long thin thermally conductive bulkhead with two fluids counter flowing in channels on either side would have large heat transfer areas; negligible pressure drops, and temperature control capability. (See also W76-109861) (Buchanan-Davidson--Wisconsin)
W76-10990

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. E. Huguenin, and J. T. Kildow.
In: 'The Use of Flowing Biological Systems in Aquaculture, Sewage Treatment, Pollution Assay and Food-Chain Studies,' Report No. NSF-RA-E-74-038, July 15, 1974, p. 158-178. 3 tab., 23 ref.

Descriptors: *Recycling, *Aquiculture, *Sewage effluents, *Regulation, *Marketing, *Attitudes, Marine animals, Hazards, Monitoring, Risks, Operations research, Thermal water, Viruses, Human diseases, Public health, Food chains.
Identifiers: Sea food farming.

Promising marine waste-food recycling concepts are the use of power plant thermal effluents, secondarily treated domestic sewage as marine plant fertilizer, agricultural and fishery processing in feeds, compacted solid wastes as artificial reef construction material, and sewage sludge for protein production in animal feeds. Potential sources of opposition to aquaculture are land and water rights, illegal use of chemicals, conservation and game regulations, competition for sites, fear of pollution, secondary products flooding small markets, poaching and vandalism prevention, alteration of coastal areas, transplants of organisms, and public health hazards. Legitimate public health concerns must be resolved, public policy decisions made, and realistic safe contamination levels established before societal acceptance can occur. Policies concerning marketing and design will mitigate the type and severity of opposition. Effort is needed to resolve problems concerning public health hazards, pollutant levels, food chain dynamics, application of technology to monitoring and control, pilot plant and demonstration projects, economic potential, market testing for quality and acceptance, and development of public and private institutional infrastructure. Demands for coastal zones for waste disposal and food production must be controlled to regulate risks and increase production. (See also W76-10986) (Buchanan-Davidson-Wisconsin).
W76-10991

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
Panel on Operational Safety in Offshore Resource Development, National Academy of Engineering, Marine Board, December 1972. 197 p, 11 fig, 3 tab, 109 ref, 4 append.

Descriptors: *Continental Shelf, *Fossil fuels, Water resources, *Environmental effects, *Offshore platforms, *Resources development, Area redevelopment, Oil industry, Oil pollution, Oil spills, Safety factors, Hazards, Operations, Accidents, Exploration, Exploitation, Research and development, Regulation, Inspection, Water pollution sources, Contracts, Conferences.
Identifiers: *Outer Continental Shelf, *Technology assessment, *Offshore technology.

The subject of offshore oil resource development safety is considered from the standpoint of minimizing the potential for sudden massive and small continued releases of oil to the environment. The numerous aspects of technology ranging from geophysical exploration to well workover and abandonment are described briefly, and evaluated for possible hazards. The effectiveness of present regulations and inspections is evaluated. Precedents for improved practices in other areas of government regulatory responsibility are examined and recommendations are made. The need for additional safety-related information is examined and means for improvement are recommended. Included are extracts from 'Applicability of NASA Contract Quality Management and Failure Mode Effect Analysis Procedures to the USGS Outer Continental Shelf Oil and Gas Lease Management Program'; OTC Papers: Technical Papers Presented at the 1972 Offshore Technology Conference, May 1-3, Houston, Texas. Preprints, Volume II; and Outer Continental Shelf Lands Act, 7 August 1953. (See W76-11002 thru W76-11006) (Sinha - OEIS)
W76-11001

TECHNICAL CAPABILITIES IN OFFSHORE COMPLETION AND WORKOVER OPERATIONS TO MAXIMIZE SAFETY,
Standard Oil Co. of California, Huntington Beach. Western Operations Div.
W. H. Silcox.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 116-121. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston Texas May 1-3, 1972. Paper No. OTC 1710.

Descriptors: *Water quality control, *Fossil fuels, *Environmental effects, *Oil pollution, *Resources development, Offshore platforms, Safety, Oil spills, Continental Shelf, Oil wells.
Identifiers: *Outer Continental Shelf, *Offshore technology, Well completion operations, Artificial islands, Gas well.

During completion and workover operations on oil and gas wells, producing zones are exposed in the well bore, consequently the presence of oil and gas under pressure in the well is always a real possibility. The oil industry, operators, contractors and suppliers, have long recognized the sensitive nature of offshore completion and workover operations and through the years have worked continuously to improve the procedures and equipment necessary to insure proper well control. Well completion and workover operations will be reviewed along with the respective procedures and equipment utilized to maximize safety. Consideration will be given to the oil industry's ability to comply with the offshore rules and regulations promulgated by governmental agencies. The author concludes that the oil industry has the capability, equipment and experience required to insure safe, clean offshore completion and workover operations. (See also W76-11001) (Sinha - OEIS)
W76-11002

TECHNICAL CAPABILITIES IN OFFSHORE PIPELINE OPERATIONS TO MAXIMIZE SAFETY,
E. A. Milz, and D. E. Broussard.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 122-139, 7 fig, 3 tab, 7 ref. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston, Texas May 1-3, 1972. Paper No. OTC 1711.

Descriptors: *Resources development, *Water quality control, *Pipelines, *Fossil fuels, *Environmental effects, Continental shelf, Safety, Operations, Regulations.
Identifiers: *Outer continental shelf, Offshore technology, *Offshore pipelines.

Design, construction and operation of offshore liquid and gas trunklines have many similarities to lines onshore. However, there is one major difference; cost. Offshore pipelines are significantly more expensive than those onshore to construct and to operate, and failures are also more expensive. Other factors which make offshore pipelines different from those onshore are environmental conditions (wind, waves, and currents; bottom soils which are usually soft and easily deformed; and seawater as a corrosive medium), inability to physically see the pipe once it is in place, and relatively great distances between locations at which contact is made with the pipe. For these reasons, offshore pipeline construction is usually conservative and offshore pipelines are operated and maintained so as to minimize risk of failure. This paper reviews the design, construction, and operation of offshore pipelines, with emphasis on steps which are normally taken to maximize safety and thereby to minimize the cost of failures. Offshore pipeline failure experience is reviewed and governmental regulations which govern offshore pipelines are discussed. (See also W76-11001) (Sinha - OEIS)
W76-11003

TECHNICAL CAPABILITIES OF OFFSHORE EXPLORATION OPERATIONS TO MAXIMIZE SAFETY AMD ENVIRONMENTAL PROTECTION,
Humble Oil and Refining Co., Houston, Tex.
R. A. Bray, and F. B. Rees.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 140-147, 10 fig. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston, Texas May 1-3, 1972. Paper No. OTC 1712.

Descriptors: *Water quality control, *Fossil fuels, *Environmental effects, *Resources development, *Offshore platforms, Continental shelf, Safety, Operation, Oil pollution, Oil industry, Exploration, Ecosystems.
Identifiers: *Outer Continental Shelf, *Offshore technology, Energy resources, Artifical reefs, Environmental impact.

The oil industry is spending millions of dollars annually to develop and utilize improved technology to maximize safety and protect the environment in offshore operations. Considerable publicity has been given to these efforts in the areas of petroleum production and transportation. Environmental protection efforts during the exploration phase of offshore operations have been less publicized but are no less impressive. This paper describes these 'safety and environment conscious' exploration operations. Basic data obtained in the early stages of marine petroleum exploration allows an oil company to conduct subsequent exploration, production and transportation operations in a safe and prudent manner. They also contribute significantly to the general understanding of the natural processes active in the marine eco-system. Exploration related studies of current patterns, waves, sediment distribution, and the biota have promoted a healthy regard for the importance of proper development of our coastal areas and marine resources. (See also W76-11001) (Sinha - OEIS)
W76-11004

REGULATION AND SUPERVISION OF OUTER CONTINENTAL SHELF OPERATIONS ON THE PACIFIC COAST,
Geological Survey, Reston, Va.
M. V. Adams.
In: Outer Continental Shelf Resource Development Safety. A review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 148-156. Also In: Fourth Offshore Technology Conference, Vol II, held in Houston, Texas, May 1-3, 1972. Paper No. OTC 1713.

Descriptors: *Water quality control, *Resources development, *Environmental effects, *Fossil fuels, *Oil pollution, *Regulation, Operations, Safety, Offshore platforms, Continental shelf.
Identifiers: *Outer continental shelf, *Offshore technology, Energy sources, Outer Continental Shelf Lands Act.

The regulation and supervision of OCS operations is implemented by formally numbered OCS Orders issued by the Regional Oil and Gas Supervisor, with the prior approval of the Chief, Conservation Division, Geological Survey. The enforcement of these OCS Orders is performed by the District Engineer and his staff. Legislative and regulatory authority for these orders is contained in the Outer Continental Shelf Lands Act of August 7, 1953, and Part 250 of Title 30 of the Code of Federal Regulations. There are presently ten OCS Orders for the Pacific Coast which were effective June 1, 1971. The present Orders evolved from the earliest ones, dated March 31, 1965. They are the field level implementation of that portion of the OCS Lands Act which delegates administrative authority to the Secretary of the Interior. The presently effective orders cover a wide range of operations such as: marking of wells, platforms, and fixed or mobile structures; drilling and completion procedures for oil and gas wells; plugging and abandonment of wells; determination of well producibility; requirements for subsurface safety devices; pollution and waste disposal; procedure for installation and operation of platforms, fixed and mobile structures, and artificial islands; procedure for design and installation of pipelines; and procedure for the drilling of twin core holes. Enforcement of OCS Orders can be accomplished under the punitive provisions of the OCS Lands Act, but, on the Pacific Coast, good compliance is through a cooperative and persuasive relationship with the lessees. (See also W76-11001) (Sinha - OEIS)
W76-11005

GULF COAST LEASE MANAGEMENT INSPECTION PROGRAM,
Geological Survey, Reston, Va.
R. B. Krahl, and D. W. Moody.
In: Outer Continental Shelf Resource Development Safety. A Review of Technology and Regulation for the Systematic Minimization of Environmental Intrusion from Petroleum Products, National Academy of Engineering, December 1972. p 157-162, 4 tab. Also in: Fourth Offshore Technology Conference, Vol. 11, held in Houston, Texas, May 1-3, 1972. Paper No. OTC 1714.

Descriptors: *Water quality control, *Resources development, *Environmental effects, *Fossil fuels, Oil pollution, Regulations, Operations, Safety, Offshore platforms, Continental Shelf, Inspection, On-site investigations.
Identifiers: *Outer Continental Shelf, *Offshore technology, Gulf Coast, Energy sources, Outer Continental Shelf Lease Management Program.

Since December 1970 the U. S. Geological Survey has modified its OCS Lease Management Program in the Gulf of Mexico to include periodic, systematic, inspections based on statistical sampling theory. To insure a consistent interpretation and enforcement of OCS Orders and Regulations, the substance of these requirements has been expressed as a list of specific items of safety equipment and procedures. The items reflect the existence of potentially hazardous conditions if the specified equipment is missing (or not operable) or the specified procedures are not followed. Although Geologcal Survey technicians are inspecting operations daily, special inspections or randomly selected operations are conducted periodically. The special inspection results provide management with an indication of the degree of compliance with the regulations and identify operating problem areas where inspection efforts should be concentrated, based on the items found most frequently in non-compliance. Incidences of non-compliance have decreased since the initiation of the program in late 1970, and it is expected that increased industry initiative in the installation and maintenance of platform safety equipment and the development of new equipment and procedures will further reduce the incidences of non-compliance and the inherent danger thereof. (See also W76-11001) (Sinha - OEIS)
W76-11006

CHEMICAL COMPOSITION: A CONTROL ON THE PHYSICAL AND CHEMICAL PROCESSES ACTING ON PETROLEUM IN THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5B.
W76-11013

IMPACT OF CHRONIC AND ACUTE OIL POLLUTION ON SEA BIRDS,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-11020

IS OUR APPROACH TO THE OIL POLLUTION PROBLEM TOO CRUDE,
For primary bibliographic entry see Field 5C.
W76-11031

ANIMAL WASTE MANAGEMENT CONFERENCE.
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11032

ANIMAL WASTE MANAGEMENT--COMMENTS ON THE NATIONAL SITUATION,
Agricultural Research Service, Peoria, Ill. Agricultural and Natural Resources Div.
For primary bibliographic entry see Field 5D.
W76-11033

THE STATE AND REGIONAL SITUATION,
Iowa Agricultural and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5D.
W76-11034

EPA'S ROLE IN THE ANIMAL WASTE PROBLEM: PANEL DISCUSSION,
Agricultural Stabilization and Conservation Service, Des Moines, Iowa.
H. Andrew.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 6 p.

Descriptors: *Farm wastes, Farms, *Costs, *Federal government, Pollution abatement, Iowa, Waste treatment.

Agricultural Stabilization and Conservation Service, an agency of the United States Department of Agriculture, administers several programs. Included are loans to farmers on corn, soybeans, and other farm produced commodities; loans for storage facilities; the feed grain and wheat programs which involve direct payments to farmers; a commodity storage program; and, the Rural Environmental Assistance Program (REAP). All of these programs are administered at the county level by a local office staff headed by a three man committee of farmers elected by community committeemen who were elected by their neighbors. These county committees oversee the handling of millions of dollars of government funds each year. They make yield adjustments. They are also charged with the job of deciding who to approve for REAP assistance. Under REAP the Federal Government shares the cost with farmers for doing certain approved conservation and pollution abatement work including animal waste management practices. A brief history of conservation work done on farms is given. (See also W76-11032) (Cartmell-East Central)
W76-11045

SOIL CONSERVATION SERVICE PROGRAM IN ANIMAL WASTE MANAGEMENT,
Soil Conservation Service, Des Moines, Iowa.
D. T. Bondurant.
In: Animal Waste Management Conference, Iowa State University, Ames, October 13-15, 1971, 6 p.

Descriptors: *Soil conservation, *Farm wastes, *Lagoons, *Anaerobic conditions, *Runoff, Storage tanks, Waste treatment.

The feedlot registration program in Iowa went into effect on July 1, 1969, and in September, 1969, rules were adopted regulating feedlot runoff from cattle operations. The Soil Conservation Service believed that it could help with this program and, after consulting with the staff of the Iowa Water Pollution Control Commission, formulated a policy regarding activities in this work. Since then standards and specifications have been established for runoff control, anaerobic lagoons and waste storage tanks. Any operator who feels that he has a potential pollution problem, even if his operation does not require registration, may be assisted, provided that he secures the approval of the plans developed for his runoff control facilities from the Iowa Pollution Control Commission. The policy of the Service in giving assistance on manure storage tanks is to furnish one of the available standard plans if it can be used directly or can be safely adapted. The Service will not design concrete storage tanks for individual installations. (See also W76-11032) (Cartmell-East Central)
W76-11046

FARM ANIMAL WASTE MANAGEMENT: WHAT OUR MILK MARKET REQUIRES,
Wisconsin State Dept. of Agriculture, Madison. Food and Standards Div.
For primary bibliographic entry see Field 5D.
W76-11050

HOW TO PLAN AND MANAGE A LAGOON,
For primary bibliographic entry see Field 5D.
W76-11052

LEGAL ASPECTS OF ODOR AND DUST FROM FEEDLOTS,
Texas Agricultural Extension Service, College Station.
M. D. Paine.
Cattle Feeders' Information, 1972, p. 7451-7454.

Descriptors: *Legal aspects, *Odor, *Dust, *Feed lots, *Air pollution, *Regulation, Zoning, *Farm wastes, Waste treatment.
Identifiers: *Nuisance laws, Site selection, Waste management, Licenses, Non-point pollution.

Because of the current emphasis on environmental quality, all businesses, including feedlots, will become more subject to pollution regulation. A feedlot is subject to both public and private regulation. Public regulation is conducted by most states through an agency to abate, prevent, and police air

pollution. These 'clean air commissions' have made their initial efforts in major cities. Private influence on air pollution occurs through the so-called 'nuisance' laws. All persons have the basic right to enjoy their property. Any unreasonable interference with such enjoyment is legally a nuisance. In past nuisance cases, the complaining party has asked for: (1) An injunction, (2) Damages, (3) Both an injunction and damages. There are two types of nuisances--public and private. When a feedlot is run in such a manner as to disturb the rights of a large number of people, this is said to be a public nuisance. If the rights of only a few are disturbed, this constitutes a private nuisance. Selection of a remote site may be the most important thing a feedlot can do to avoid nuisance lawsuits. Feedlot operation in an area zoned for agriculture does not give absolute protection against nuisance lawsuits. There are three areas of pollution law affecting agriculture which may change in the future. These are: (1) A balancing of interest test used to determine the outcome of an injunctive action, (2) Expanding the concept of legal standing so that private citizens may, in the public interest, initiate actions against 'polluters' and (3) A model act to regulate animal feeding operations. (Cartmell-East Central)
W76-11054

A SUMMARY OF STATE REGULATIONS PERTAINING TO ANIMAL WASTE MANAGEMENT IN THE NORTH CENTRAL REGION OF THE UNITED STATES,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
L. J. Connor, J. B. Johnson, and C. B. Hoglund.
Report No. 193. Department of Agricultural Economics, Michigan State University, May 1971, 25 p, 22 ref.

Descriptors: *Regulation, *Water pollution, *Air pollution, Economics, *Farm wastes, *State governments, Legal aspects, Waste treatment, Management, *Central U.S.
Identifiers: *Waste management.

A summary is presented of present and proposed State regulations pertaining to animal waste management in the North Central Region of the United States. The regulations reported are those in effect or being proposed as of April, 1971. Summaries of regulations of the following states are included: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. State water and air pollution control agencies for these states are listed. (Cartmell-East Central)
W76-11060

DECISION MAPPING - TOOL FOR UNDERGROUND WASTE MANAGEMENT,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W76-11063

SAFE DRINKING WATER ACT - IMPLICATIONS FOR GROUND WATER QUALITY PROTECTION,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5F.
W76-11064

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-11072

OFFSHORE OIL: TECHNOLOGY - AND EMOTION,
Woods Hole Oceanographic Institution, Mass.
K. O. Emery.
Technology Review, Vol 78, No 4, p 31-32, 35-37, February 1976.

Descriptors: *Continental Shelf, Resources development, Fossil fuels, *Oil, *Offshore platforms, *Environmental effects, Gases, *Oil spills, *Oil pollution, Energy sources, Management, United States.
Identifiers: *Outer Continental Shelf, Offshore technology.

Peak production of oil and gas in the United States has passed, but the continental shelves offer the best apparent chance for a fairly large immediate source of supplementary oil and gas, with the best prospects for the Atlantic coast being structures in the Wilmington Canyon Trough off Delaware and the Georges Bank Trough off New England. Other short-term sources of oil and gas are from inland deposits of oil shale and coal. Additional supplementary energy in the short term can come from increased use of nuclear fission reactors and perhaps in the long term from nuclear fusion. Wind, tides, waves, and temperature differences in the oceans are considered long-term sources of energy, but ones that will not heat the earth as do fossil fuels and nuclear reactors. All of these energy sources must be investigated and those that are deemed feasible must be developed rapidly before the options of the United States become limited by continued loss of capital by purchasing oil from abroad. (Sinha-OEIS)
W76-11090

OIL SPILLS AND OFFSHORE PETROLEUM,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
R. J. Stewart.
Technology Review, Vol 78, No 4, p 47-59, February 1976. 19 fig, 7 ref.

Descriptors: *Continental Shelf, *Resources development, *Oil spills, *Oil pollution, *Offshore platforms, *Environmental effects, Fossil fuels, Water resources, Production, Estimating, Leases.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact.

The possible consequence of oil spills from offshore production has been the central issue in debate over the recent expansion of the federal government's offshore leasing program. It is possible to make some estimates of the magnitude and frequency of oil spillage from offshore production. While long-term environmental damage can't be estimated with predictive data, some qualitative judgments of short-term importance can be made by comparison with known spills of similar size in similar climates. Spill data can be used to look at some issues of equity: to what extent will a local region be forced to bear the brunt of the disadvantages of offshore oil, while the nation as a whole shares in the benefits. Drilling in certain OCS regions appears less likely to have adverse effects upon some regions than upon others. Offshore oil production as now practiced in the Gulf of Mexico contributes a relatively small portion to the total U.S. spillage figure. Compared to the alternative of increased imports, offshore oil appears to be a messier means of acquiring crude oil, although offshore oil proponents have not attempted to sell it on the basis of its environmental advantages. Modern technological developments, although not aimed primarily at reducing spills, may provide superior spill prevention performance. Also significant and often neglected is that future offshore oil developments will introduce oil spillage to regions currently relatively free of this form of pollution. The assertion that because one region can apparently withstand the stress of oil pollution, others can too, should not be accepted unproven. (Sinha-OEIS)
W76-11092

OFFSHORE OIL SPILLS AND THE MARINE ENVIRONMENT,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
S. F. Moore.
Technology Review, Vol 78, No 4, p 61-67, February 1976. 8 fig, 3 ref.

Descriptors: *Continental Shelf, *Resources development, Water resources, *Oil spills, *Oil pollution, *Environmental effects, Monitoring, Ecosystems, Data, Population, Habitats.
Identifiers: *Outer Continental Shelf, Settlement(Biological), Environmental impact.

There are two phases in the effects of an oil spill on the environment. First come the initial impacts of a spill, which are the actual perturbations of an area's physical/chemical and biological features. Then follows the recovery period, which is the return to pre-spill conditions following initial impacts. This recovery doesn't just include biological recovery, but also physical/chemical recovery of the water, sediments, etc. Our present state of understanding does not allow a comprehensive and definitive answer to the question of biological effects of Atlantic/Alaskan offshore spills. Any apparent attempt to answer this question systematically implies that the problem is understood well enough to warrant an attempted answer when, in fact, so many basic requisite facts are unknown that there is no way of knowing the validity of the analysis. To make these environmental decisions in an environmentally and economically acceptable way a closer cooperation is advocated among decision-makers, modelers, and monitors. And, this interaction must be adaptive and reconsidering, so that if new data indicates undesirable outcomes of a decision, it will immediately be reassessed and adapted to fit improved knowledge. Monitoring becomes essential not just for regulation and enforcement, but as an integral part of an on-going, adaptive decision-making process, which is as flexible as the ecological system of which it is a part. (Sinha-OEIS)
W76-11093

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
D. Panagiotakopoulos.
Journal of Environmental Systems, Vol. 5, No. 2, p. 133-147, 1975. 4 fig., 6 ref.

Descriptors: *Environment, *Management, *Optimum development plans, *Decision making, Methodology, Alternative planning.
Identifiers: *Goal programming, *Multi-objective planning.

A method is presented which allows for a sufficiently realistic representation of the total region, deals systematically with multiple objectives through goal programming optimization techniques, and suggests an effective interaction between the decision maker and the analyst for devising compromises among conflicting objectives. Essentially, the procedure is directed toward establishing the economic growth/environmental quality possibility frontier and allows alternative waste management policies or schemes to be generated and presented to the decision maker, along with their evaluation on the basis of each policy's impact on the economic, environmental, and technological components of the system; measures of effectiveness for the alternatives; and the decision maker's preferences. The desirable levels of these criteria are referred to as objectives (or

goals, or targets) of the decision maker, with the analyst's function to develop policies for getting as close to these objectives as is economically, technically, practically, and legally feasible. The technique provides means for generating policies corresponding to one or more equally desirable compromises among goals, on the basis of 'objective' marginal rates of substitution and subjective priority rankings. The method is based on network flow models representing transformation of quantities--a quantity is 'transformed' when it changes form or location in a way that affects the types and attributes of further transformations. (Auen-Wisconsin)
W76-10582

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL 1),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins, and J. C. Jurkovich.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 656, $10.00 in paper copy, $3.00 in microfiche. Completion Report, (one of three companion volumes), December 1975. 318 p, 34 fig, 45 tab, 13 ref. OWRT C-3355(3739) (2).

Descriptors: *Reservoir operation, *Dynamic programming, *Water allocation(Policy), *Municipal water, *Operating costs, Water distribution(Applied), Electric power costs, Water supply, Optimization, Water policy, Water management(Applied), Reservoir storage, Reservoir yield, Water costs, Reservoirs, Water requirements, Systems analysis, Water resources, Texas, Computer models.
Identifiers: *Multiple reservoir system, Dallas(Tex), *Parallel and series reservoir systems, *Block rate costs, Nonlinear costs, Sectioning search, Penalty costs, Deterministic streamflow, System states, Water distribution simulation, Intracity distribution costs.

A deterministic forward dynamic programming optimization computer model was developed to find a least cost sequence of withdrawals or releases from a system of single purpose reservoirs supplying a central demand area. Optimal solutions for parallel and series systems of up to four reservoirs were determined. Inaccuracies in the dynamic programming model produced by reservoir volume discretization were reduced by a modified sectioning search. A realistic cost structure is permitted. Nonlinear water treatment, water purchase, and pumpage power costs are included. Block rate power cost structures are utilized. The demand area is decomposed into service areas, with additional costs being dependent on the particular service area. Approximate flow dependent pumping costs for intracity pumping can be included. For water conserving policies, penalty costs for evaporation water losses of lowering of reservoirs below critical levels are included. Constraints include bounds on pumpages, releases, reservoir levels, and service area flows. The model is applied to the City of Dallas multiple reservoir system. Results are given for actual operational problems faced by the City of Dallas, including supply from four parallel reservoirs currently used by the City and supply from a future series system of two reservoirs to be operated with a minimum water loss objective. (See also W76-10605 and W76-10606)
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 657, $18.75 in paper copy, $3.00 in microfiche. Completion Report, (one of three companion volumes), December 1975. 748 p, 13 append. OWRT C-3355(3739) (3).

Descriptors: *Reservoir operation, *Dynamic programming, *Water allocation(Policy), *Municipal water, *Operating costs, Water distribution(Applied), Electric power costs, Water supply, Optimization, Water policy, Water management(Applied), Reservoir storage, Reservoir yield, Water costs, Reservoirs, Water requirements, Systems analysis, Water resources, Texas, Computer models.
Identifiers: *Multiple reservoir system, Dallas(Tex), *Parallel and series reservoir systems, *Lewisville reservoir, Grapevine reservoir, Tawakoni reservoir, Hubbard reservoir, Aubrey reservoir, *Block rate costs, Nonlinear costs, Sectioning search, Penalty costs, Deterministic streamflow, System states, Water system operation, Water distribution simulation, Intracity distribution costs.

This report presents appendices referenced in a companion report entitled 'Optimal Operating Policy for Multiple Metropolitan Water Supply Reservoir Systems: Theory and Applications' by M. A. Collins and J. C. Jurkovich. The appendices provide documentation of data sources and listings of various inputs and outputs for the dynamic programming optimization model discussed in the companion volume. (See also W76-10604 and W76-10606)
W76-10605

SOLVING DISCRETE-VARIABLE MULTIPLE-CONSTRAINT NON LINEAR PROGRAMS: THE DECISION STATE METHOD, (VOL. 3),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
V. K. Dharmadhikari, and M. A. Collins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 709, $8.00 in paper copy, $3.00 in microfiche. Completion Report, (one of three companion volumes), June 1975. 115 p, 4 fig, 11 tab, 27 ref, 4 append. OWRT C-3355 (3739) (4).

Descriptors: *Dynamic programming, *Resource allocation, *Optimization, Reservoir design, Operations research, Optimum development plans, Mathematical studies, Reservoir operation, Decision making.
Identifiers: *Decision state method, *Algorithm 2, *Discrete variable optimization, Nonlinear optimization, Nonlinear programming, MMDP algorithm, Mixed integer programming, Decision space, State space, Zero-one problems, Programming tactics, Block angular constraints, Split-block-angular constraints.

A new method for obtaining exact optimal solutions for a class of discrete-variable resource-allocation problems is presented. This decision-state method, unlike conventional dynamic programming method which works only in state space, works in state and decision spaces. It uses only a fraction of the points in the state space at which the state functions are discontinuous; and thus overcomes to some extent the curse of dimensionality. It carries the cumulative decision-strings associated with these points and thus avoids backtracking to recover optimal decisions. The method is given in Algorithm 2; it is proved that the algorithm finds all exact optimal solutions. The method is adapted for solving problems with special structures such as block-angular or split-block-angular constraints and resultant substantial advantages are demonstrated. A computer implementation of Algorithm 2 is given which combines the flexibility and adaptability of the algorithm with the characteristics of a digital computer and good programming practices. The Algorithm 2 performance on many resource-allocation problems is reported and compared with that of the MMDP algorithm. It is shown for the class of problems at which the two are aimed, the decision-state Algorithm 2 performed uniformly and substantially better. (See also W76-10604 and W76-10605)
W76-10606

INTERDISCIPLINARY/INTERINSTITUTIONAL REQUIREMENTS FOR WATER RESOURCE PLANNING: PROCESSES TO ENHANCE COOPERATION,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
For primary bibliographic entry see Field 6B.
W76-10609

6B. Evaluation Process

STRATEGIES FOR NATURAL RESOURCE DECISION-MAKING: COMMENTS ON THE STAFF REPORT,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6E.
W76-10503

INTERBOARD PLAN FOR THE GREATER FINGER LAKES - OSWEGO RIVER BASIN,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 4A.
W76-10506

WATER SUPPLY AND SEWAGE FACILITIES PLAN UPDATE - 1970 (1974 SUPPLEMENT),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley Pa.
For primary bibliographic entry see Field 5G.
W76-10508

WATER POLLUTION CONTROL ACT OF 1972, SOCIAL IMPACTS, EIGHT CASE STUDIES.
Abt Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10569

BENEFITS FROM WATER POLLUTION ABATEMENT, PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10580

THE ECONOMIC IMPACT OF RECREATIONAL LAND-USE IN AN ISLAND ENVIRONMENT: A CASE STUDY OF JEKYLL ISLAND, GEORGIA,
Georgia Marine Science Center, Savannah.
C. F. Floyd, and C. F. Sirmans.
Technical Report No. SG 75-7. 199 p. 3 fig., 104 tab., 27 ref., 3 append 1975.

Descriptors: *Recreation, *Economic impact, *Georgia, *Islands, *Regional analysis, Tourism, Employment, Projections, Human population, Social impact, Migration, Access routes, Use rates, Recreation facilities, Alternative planning, Decision making, Recreation demand, Direct benefits, Indirect benefits, Coasts.
Identifiers: *Jekyll Island(Ga), *Demography, Economic base, Multiplier effects, Case study.

Data were compiled to indicate the process by which recreational land utilization affects employment, income, population and migration patterns, and housing (type of structure, density, and location). The demand for coastal area recreation facilities was classified, and inter-island comparative land use patterns analyzed, providing estimates of the economic impact of Jekyll Island on

the eleven coastal counties of Georgia and the State. While the per capita income had more than doubled in all counties between 1950 and 1971, it was still below the national average. Computations indicate that expenditures caused by the demand for services provided by Jekyll Island had a substantial primary and secondary impact on the income and employment of the total travel industry in Georgia. The key role of Jekyll Island is that it serves as a major 'destination' area for visitors. The island does not create much employment, but it is possible that the entire recreational resources along the Georgia coast would significantly impact employment. In order for the Georgia travel industry to grow, the travel image of the State as a whole needs progressive enhancement. The provision of more destination areas for out-of-state visitors should be a key policy for decision makers. The entire coastal area has potential importance in both the local and total State economy. (Auen-Wisconsin)
W76-10581

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
For primary bibliographic entry see Field 6A.
W76-10582

PROBLEMS AND SOLUTIONS IN ESTIMATING THE DEMAND FOR AND VALUE OF RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
R. L. Gum, and W. E. Martin.
American Journal of Agricultural Economics, Vol. 57, No. 4, p. 558-566, 1975. 4 tab., 13 ref.

Descriptors: *Recreation demand, *Estimating, *Evaluation, *Arizona, Resource allocation, Elasticity of demand, Model studies.

Described is a large-scale empirical study of outdoor recreation in Arizona which used the individual observations approach for estimating demand relationships, by including the influence of substitute recreation activities, by allowing for individual tastes and preferences, and by developing resource values based upon estimated individual demand relationships. The methodology is detailed and illustrative and summary results are included. Of special importance is that fact that estimates of resource value are as large as estimates of value obtained by the gross expenditures method. The procedure is an efficient and reasonably accurate method for estimating demand and value and can be easily adapted to other areas. The study used a large number of individual observations (by mail questionnaire) and includes the mileage variable. By focusing on all types of rural recreation activities in all regions of the state, it was possible to include the prices of substitute attractions in the regression equations; and by using the individual observation approach, the problems of multicollinearily between cost variables and the distance variables are avoided. It is suggested that the most fruitful area for additional conceptual analysis is in the interpretation of estimates of value developed for nonpriced goods rather than in additional estimation procedures. (Auen-Wisconsin)
W76-10585

THE ECONOMICS OF DEVELOPING THE RESOURCES OF THE WORLD'S OCEANS,
Akademiya Nauk SSSR, Moscow.
P. Bunich.
Problems of Economics, Vol. 28, No. 4, p. 76-98, 1975. (Translated from 'Voprosy ekonomiki, No. 11, 1974).

Descriptors: *Oceans, *Resources development, *Economic feasibility, *Regulation, Assessments, Comprehensive planning, Integrated control measures, International law, Legal aspects, Foreign countries, Water pollution control, Oil, Metals, Chemicals, Marine fisheries, Transportation, Economic rent, Sinking fund.

Prefaced by a comprehensive discussion of the wealth, the economic actualities and the potential of harvesting protein, oil, minerals, chemicals, and sources and effects of various pollutants, the discussion centers on the USSR position of an integrated approach to ocean development. In the seas within its jurisdiction, the USSR proposal is a system of rent payments and fines for complete and economically integrated utilization of the ocean's mineral and food resources into cost-accounting collectives to form an incentive fund. The calculation of rent norms presupposes the construction of prices on the basis of marginal sales conditions, i.e., the difrerence between the enterprise cost of production of the less efficient operation and the average, or more efficient, enterprises will reflect the amount of rent. By taking into account the interest rate for credit according to the Marxian method, it would be possible to economically appraise each individual ocean resource. Of significant economic importance are material sanctions imposed on polluters, on those that violate established quotas on biological resources, and activities that are detrimental to other branches of the ocean economy. These sanctions would include full restitution of damages, including shortfalls in profits. Proposals for the long-range USSR 'Ocean Economic Plan' are also outlined. (Auen-Wisconsin).
W76-10587

WATER TO THE FIELDS: INDIA'S CHANGING STRATEGY,
Sussex Univ., Brighton (England). Inst. of Development Studies.
For primary bibliographic entry see Field 3F.
W76-10589

NATIONAL OCEAN POLICY: PRIORITIES FOR THE FUTURE,
Committee on Commerce (U. S. Senate). Committee on Commerce National Ocean Policy Study.
For primary bibliographic entry see Field 6E.
W76-10591

RATIONALE FOR A WATER POLLUTION CODE (PART II): SOCIAL ASSESSMENT,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5G.
W76-10592

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10595

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: THEORY AND APPLICATIONS, (VOL 1),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10604

OPTIMAL OPERATING POLICY FOR MULTIPLE METROPOLITAN WATER SUPPLY RESERVOIR SYSTEMS: APPENDICES, (VOL. 2),
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6A.
W76-10605

INTERDISCIPLINARY/INTERINSTITUTIONAL REQUIREMENTS FOR WATER RESOURCE PLANNING: PROCESSES TO ENHANCE COOPERATION,
Oklahoma Univ., Norman. Bureau of Water and Environmental Resources Research.
G. W. Reid, and J. O. Dritt.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 632, $6.00 in paper copy, $3.00 in microfiche. Completion Report, January 1976. 130 p, 10 illus, 35 ref, 7 append. OWRT X-122(3749) (1).

Descriptors: *Organizations, *Administrative agencies, *Institutions, *Planning, Constraints.
Identifiers: Interdisciplinary research, Processes to enhance cooperation.

This report focuses on the difficulties and opportunities for effective cooperation within an interdisciplinary research group. While emphasizing such research within an academic environment and on water resources related cases, this study is directed toward a broad spectrum of research project leaders and team participants. The analytical framework was designed to point out differences that exist between single, multidisciplinary and interdisciplinary team research. An opportunity to respond and share future results is provided. Several steps were suggested for the optimal use of interdisciplinary personnel in water resources research. The salient organizational and situational conditions include the establishment of favorable internal relationships and coalitions as a basis for administrative support and cooperation. The choice of the team leader is extremely important with particular emphasis apparently not on technical expertise but on interpersonal abilities. Defending the program against external pressures and the setting of policies and procedures to promote effective interpersonal and interinstitutional communications are perhaps the leader's most important tasks. His personal work habits and ability to work with people are critical characteristics. An oversight committee has been suggested as an extremely useful and necessary tool to guide and advise program activities from the viewpoint of a separate, but concerned, entity. Such a committee would interface with the program during all phases of a project, especially during technology transfer (those affected by the study results, such as concerned agencies, and publics).
W76-10609

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.
For primary bibliographic entry see Field 6G.
W76-10610

ECONOMIC FRAMEWORK FOR GROUNDWATER QUALITY MONITORING,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-10657

MATCHING RESOURCES AND PEOPLE,
Soil Conservation Service, Washington, D. C.
N. A. Berg.
Water Spectrum, Vol. 6, No. 3, p. 19-25, 1974. 7 p, 11 photo.

Descriptors: *Land development, *Recreation facilities, *Land use, Land, Environmental effects, Recreation demand, Recreation, Rural areas, Land management, Land resources, Winds, Rain, Soil erosion, Erosion, Sedimentation rates, Storm water, Flood damage.

The great increase in leisure time in America has multiplied the demand for land suitable for recreational purposes. A related demand has been the increase in land purchases in rural areas by those from the city desiring second homes. Serious environment consequences have resulted from these changes: the tearing up of large tracts of land left exposed to wind and rainstorms for long periods has sped the process of soil erosion and greatly increeased sedimentation rates; the paving of a large percentage of the land without considering the likely changes in stormwater runoff and groundwater levels has increased flood damages and ruined thousands of miles of stream banks. In the Rural Development Act of 1972 the Department of Agriculture received authority to intensify its fact gathering in land inventorying and monitoring. The Secretary of Agriculture has established a Committee on Planning and Policy for Land Use and Land Correction to stimulate interagency thinking on land use and to ready the Department to give more effective assistance to states and local governments in setting land-use policies. Such integrated action is necessary since the individual landowner is not always able to cope with the land-use agencies. (Gagliardi-Florida)
W76-10723

DAMS OF PORK,
J. McCaull.
Environment, Vol. 17, No. 1, p. 11-16, (1975). 6 p, 1 illus, 4 photo, 4 ref.

Descriptors: *Dams, *Cost allocation, *Cost analysis, *Cost-benefit analysis, *Cost-benefit ratio, *Cost-benefit theory, Costs, Economics, Economic impact, Economic justification, Economic prediction, Inflation(Economic), Environment, Environmental control, Water management(Applied), Water, Water policy.
Identifiers: Administrative regulations, Evidence.

A recent government report on a cross section of dam-construction projects shows that advantages have been grievously overstated and costs greatly understated. As a result, estimated annual economic benefits from the projects have been inflated by many millions of dollars. The benefit-cost determination should be reassessed so that allowance is made for unexpected expenses, environmental costs, and less-than-anticipated financial gains. A General Accounting Office (GAO) report shows many specific instances in which sponsoring agencies, intent on having the projects authorized, overstated expected annual monetary gains to be realized from water management activities and simultaneously sharply understated estimated costs for annual operations and maintenance. The study clearly suggests a strong prejudice toward exaggerated benefit-to-cost ratios used by agency officials to justify water-use projects. In the past, if the ratio has been greater than one-to-one (benefits exceeding costs), the project has generally been judged economically acceptable. As a potential solution to the prejudice factor, it is suggested that a two or three-to-one ratio be implemented. The recommended action would allow the benefit-to-cost ratio a much larger margin for error to compensate for rising costs and environmental destruction. (Gagliardi-Florida)
W76-10738

ENVIRONMENTAL PROTECTION AGENCY: POLICIES AND PROCEDURES FOR STATE CONTINUING PLANNING PROCESS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10762

PREPARATION OF STATE WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10763

ADJUSTMENTS DUE TO A DECLINING GROUNDWATER SUPPLY: HIGH PLAINS OF NORTHERN TEXAS AND WESTERN OKLAHOMA,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 4B.
W76-10874

COMPREHENSIVE WATER SUPPLY STUDY FOR NEW YORK STATE,
New York State Dept. of Health, Albany. Bureau of Public Water Supply.
J. C. Bumstead.
Journal American Water Works Association, Vol. 68, No. 1, p. 31-376, 1976.

Descriptors: *Comprehensive planning, *Water supply, *New York, Economies of scale, Municipal water, Legislation, Water districts, Water management(Applied), Future planning(Projected), Long-term planning.

Between 1964 to 1974 the New York State Comprehensive Public Water Supply Study and Regional Program prepared reports designed to develop master plans for area-wide water utility systems; to make municipalities aware of and accept responsibility for correcting current and impending inadequacies in quantity and quality aspects of community water systems; and to promote implementation of needed projects in conformity with accepted master plans. Implementation of the reports has not been encouraging as shown by the efforts in the various counties. Approximately 76% of the systems studied need major improvements (source, transmission, treatment, pumping, storage, distribution). The reports have added value in that they provide information for land-use planning. Intermunicipal or regional cooperation would be desirable, but needs financial incentives and statutory amendments. Economies of scale of area-wide utilities, coordinated management of water systems, and integrated services have potential benefits for cooperating communities. Long-range planning for future water needs is necessary and must be part of routine operations. Local officials should consider expediting project planning to avoid added inflationary costs and serious water shortages. The data, conclusions, and recommendations of the report should be adjusted periodically. (Buchanan-Davidson--Wisconsin)
W76-10982

WATER SUPPLY FOR THE GREATER NEW YORK METROPOLITAN AREA,
Corps of Engineers, New York. Northeastern U.S. Water Supply Study.
K. E. Schilling.
Journal American Water Works Association, Vol. 68, No. 1, p. 37-40, 1976.

Descriptors: *Future planning(Projected), *Water supply, *New York, *Northeast U. S., *Baseline studies, New Jersey, Connecticut, Recycling, Water demand, Water transfer, Diversion, Groundwater recharge, Water resources development, Hudson River, Delaware River, Water management(Applied), Measurement.
Identifiers: Metering, Waste water recycling.

The Northeastern U.S. Water Supply Study authorized evaluation of present and long-term water supply needs, institutional and cost-sharing options to implement water supply projects; and preparation of water supply development and management plans. The study area contains thirteen states and the District of Columbia. The objective of the study was to guarantee water supply under drought conditions. Water supply and waste water management alternatives; environmental impacts; and legal institutional, and economic issues were considered. Federal financing is needed for some projects. Possible choices appear to be inter- and intra-state source areas to be developed, demonstration projects, and resolution of technical uncertainties which might impede the solution of water supply problems. Continuing studies are devoted to a demonstration project for total resource management combined nuclear electric powerplant cooling with a land application and waste water treatment system for groundwater recharge. Hudson and Delaware River development is imperative. Instate sources can probably supply New York and Connecticut through the year 2000, but after 2000 to 2020 New Jersey will need outside water. New York and New Jersey must share the Hudson River. High flow skimming unsupported by reservoirs until 2000-2020 is the least damaging and most flexible solution. Metering in New York City and wastewater management should be considered. (Buchanan-Davidson--Wisconsin)
W76-10983

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

AN ECONOMIC APPRAISAL OF ALTERNATIVE DAIRY WASTE MANAGEMENT SYSTEMS DESIGNED FOR POLLUTION CONTROL,
Economic Research Service, East Lansing, Mich. Farm Production Economics Div.
For primary bibliographic entry see Field 5D.
W76-10547

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, METAL FINISHING INDUSTRY,
Lancy Labs., Zelienople, Pa.
For primary bibliographic entry see Field 5D.
W76-10555

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, METAL FINISHING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10556

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRON AND STEEL INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10557

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, IRON AND STEEL INDUSTRY,
McKee (Arthur G.) and Co., Cleveland, Ohio.
For primary bibliographic entry see Field 5D.
W76-10558

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PULP AND PAPER INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10559

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PETROLEUM REFINING INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10560

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, LEATHER TANNING INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10561

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, FERTILIZER INDUSTRY.
Development, Planning and Research Assoc., Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W76-10562

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PLANT CLOSURES.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10563

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, IRRIGATED AND NON-IRRIGATED AGRICULTURE.
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 5G.
W76-10564

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, NON-FERROUS METALS INDUSTRY,
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10565

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, TEXTILE INDUSTRY.
National Bureau of Economic Research, Inc., New Haven, Conn.
For primary bibliographic entry see Field 5G.
W76-10566

WATER POLLUTION ABATEMENT TECHNOLOGY: CAPABILITIES AND COSTS, CONTROL OF WATER POLLUTION FROM SELECTED NONPOINT SOURCES.
Mid West Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10567

WATER POLLUTION CONTROL ACT OF 1972, MUNICIPAL OPTIONS.
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W76-10568

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 1).
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10570

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, COLORADO RIVER BASIN, (PART 2),
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W76-10571

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME I),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10572

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, SAN FRANCISCO BAY/CENTRAL VALLEY, (VOLUME II),
Little (Arthur D.), Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10573

BENEFITS FROM WATER POLLUTION ABATEMENT, PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W76-10580

PRICES AND PROPERTY RIGHTS IN THE FISHERIES,
Delaware Univ., Newark. Dept. of Economics.
R. J. Agnello, and L. P. Donnelley.
Southern Economic Journal, Vol. 42, No.2, p. 253-262, 1976. 3 tab., 12 ref.

Descriptors: *Ownership of beds, *Commercial fishing, *Demersal fish, *Shellfish, *Competitive prices, Fish harvest, Seasonal, Public access, *Fisheries, *Prices.
Identifiers: *Property rights, Common property, Private property.

The shortrun effect of the property right structure on the exvessel prices and harvest quantities of demersal fisheries catch was investigated. Whenever fish harvesting is treated as a common property resource, distortions occur in the intraseasonal production patterns of the industry, which take the form of relatively large price variations. Where both private and common property resources are present, common property price distortions take the form of lower exvessel prices. In this situation arbitrage from private property mitigates price variations across property right structures in addition to reducing intertemporal price variations in general. A model is developed using the oyster catches in the Atlantic and Gulf coast oyster fishery. The oyster industry was chosen as it provided varying property right structures between coastal states. The conclusion is that property right structures do indeed make a difference in harvesting patterns, and if the oyster industry at the harvesting level is reasonably competitive, the indication is that common property generates social losses in oyster harvesting. When a state sets aside some part of the oyster grounds for private use, harvesters tend to reap a benefit of the common grounds during the initial part of the season, postponing catch on their private grounds, which tends to smooth intraseasonal price movements. (Auen-Wisconsin).
W76-10586

ENABLING LEGISLATION: POSSIBILITIES FOR THE COMMERCIAL FISHING INDUSTRY,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
For primary bibliographic entry see Field 6E.
W76-10593

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE ANIMAL FEED, BREAKFAST CEREAL, AND WHEAT STARCH SEGMENTS OF THE GRAIN MILLS POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10594

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TEXTILE, FRICTION MATERIALS AND SEALING DEVICES SEGMENT OF THE ASBESTOS MANUFACTURING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D.C. Effluent Guidelines Div.
For primary bibliographic entry see Field 5G.
W76-10595

ECONOMIC EFFECTS OF AGRICULTURAL LAND-USE MANAGEMENT ON SOIL EROSION AND FARM INCOME IN THE OBION-FORKED DEER RIVER BASIN,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 4A.
W76-10612

DO REGULATED FREIGHT RATES DISCOURAGE RECYCLING,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W76-10676

THE EFFECT OF CHANGING INPUT AND-PRODUCT PRICES ON THE DEMAND FOR IRRIGATION WATER IN TEXAS,
Texas A and M. Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W76-10810

A CLEAN PIECE OF PAPER,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W76-10842

REASONS FOR HAVING THE IVL-INSTITUTE FOR WATER AND AIR POLLUTION CONTROL RESEARCH. (VARFOR ETT IVL-INSTITUT FOR VATTEN- OCH LUFTVARDSFORSKNING.),
For primary bibliographic entry see Field 5G.
W76-10853

THE COST OF COMPLYING WITH FEDERAL WATER POLLUTION LAW.
For primary bibliographic entry see Field 5G.
W76-10872

ADJUSTMENTS DUE TO A DECLINING GROUNDWATER SUPPLY: HIGH PLAINS OF NORTHERN TEXAS AND WESTERN OKLAHOMA,
Texas A and M Univ., College Station. Water Resources Inst.

For primary bibliographic entry see Field 4B.
W76-10874

PROBLEMS OF PUBLIC WORKS PROJECTS IN THE PRESENT ECONOMIC CLIMATE,
San Bernardino Valley Municipal Water District, Calif.
J. A. Beaver, and J. G. Thon.
Journal American Water Works Association, Vol. 68, No. 1, p. 26-35, 1976.

Descriptors: *Water resources development, *Economic feasibility, *California, Water distribution(Applied), Water districts, Operation and maintenance, Construction costs, Financing, Materials, Labor supply, Interest rates, Investment, Capital costs, Inflation(Economic), Water demand.
Identifiers: *Santa Ana River(Calif), San Bernardino Water District.

Demand for major water transmission and distribution projects in many areas of California is close to peaking. Experiences of the San Bernardino Valley Municipal Water District are described. After many legal battles, the principal water districts on the Santa Ana River watershed created an agency to draft and adopt a water quality management plan. The plan's objectives were to prevent further degradation of surface and groundwater and to improve water quality of areas along the river that had been seriously abused and threatened. The Santa Ana Watershed Project Authority was established to guide and direct financing, construction, and operations. Recent rising costs, material shortages, problems with labor contract renewals, and failure to market bonds authorized by the electorate have presented many difficult problems to public works projects. However, shortages of material and labor and increasing prices and interest rates on investment capital provide a self-correcting mechanism, since they encourage curtailment of capital expenditures. Most utilities are revising their construction programs downward; this will affect materials and labor and means that plants now working full production will have spare capacity. This will slow the rate of inflation, reduce interest rates, make capital more available, and consequently increase unemployment. (Buchanan-Davidson--Wisconsin)
W76-10980

ECONOMIC CONSIDERATIONS INVOLVED IN SELECTING TYPES OF CONFINEMENT AND WASTE DISPOSAL SYSTEMS FOR SWINE AND BEEF,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11043

THE IMPACT ON DAIRY FARM ORGANIZATION OF ALTERNATIVE MANURE DISPOSAL SYSTEMS. A METHOD OF ASSESSING THE COST OF ENVIRONMENTAL REGULATION,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 5D.
W76-11061

SHARING THE OFFSHORE OIL BONANZA.
Technology Review, Vol 78, No 4, p 39-45, February 1976. 4 fig.

Descriptors: *Continental Shelf, *Resources development, Economics, Water resources, *Oil industry, *Fossil fuels, Management, Leases, Income.
Identifiers: *Outer Continental Shelf.

This article is an adaptation by the Editors of Technology Review of 'The O.C.S. Petroleum Pie,' by John W. Devanney, III, published in February, 1975, by the M.I.T. Sea Grant Program as Report Number MITSG 75-10, Index Number 75-310-Nme. (Copies of the full report are available at the Marine Resources Information Center, Room 5-331, M.I.T., Cambridge, Mass., 02139, for $2.50.) Alternative policies for managing petroleum which may exist on the outer continental shelves of the U.S. are the subject of considerable current contention. The purpose of this report is to analyze the present system and the principal alternatives and their likely consequences. Offshore oil is not basically an environmental issue and not basically an issue of shoreside jobs and development; it is, rather, primarily a question of the amount and distribution of the national income involved -- the difference in the cost of offshore oil and imported oil and the allocation of this difference between the developer and the public and between the adjoining coastal state and the rest of the nation. Slicing up the offshore petroleum pie will be a tricky business; but if the knife is sharp -- that is, if the debate is informed -- and if the slicing is done in clear public view, there should be quite a piece for all concerned. (Sinha-OEIS)
W76-11088

A THOROUGH LOOK AT CURRENT OFFSHORE PETROLEUM OPERATIONS.
Marine Technology Society Journal, Vol 7, No 7, p 16-23, October-November 1973. 7 fig.

Descriptors: *Continental Shelf, *Resources development, Water resources, *Oil industry, Fossil fuels, *Environmental effects, *Offshore platforms, Leases, Drilling, Operation, Planning, Management.
Identifiers: *Outer Continental Shelf, Environmental impact.

The article contains excerpts from the study by D. E. Kash and I. L. White, 'Energy Under the Oceans,' sponsored by the National Science Foundation and undertaken by the Science and Public Policy program at the University of Oklahoma. (Completed in September, 1973, the full report is available through the University of Oklahoma Press for $4.50.) The summary quoted here was also prepared by the interdisciplinary team which conducted the 21-month study. Four areas from which it might be possible to increase domestic oil and gas production within the next twelve years are: onshore in the lower 48 states, Alaska, state lands offshore, and the outer continental shelf (OCS). Of the four, only Alaska and the OCS offer a potential for significant increases. There are objections to each of the domestic alternatives and to imports. The principal objections to Alaska and the OCS are environmental. Proponents of developing either Alaska or the OCS contend not only that imports are likely to be more of an environmental threat, but also that imports create national security, balance of trade, and economic problems. Policy-makers who have to choose from among these three alternatives must seek to balance demands for more energy. Technology assessment, an attempt to identify, analyze, and evaluate potential environmental, legal/political, and other social impacts, is one approach that can be used for informing policy-makers of what the consequences of the choice or choices are likely to be. (Sinha-OEIS)
W76-11091

OIL SPILLS AND OFFSHORE PETROLEUM,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-11092

6D. Water Demand

PROBLEMS AND SOLUTIONS IN ESTIMATING THE DEMAND FOR AND VALUE OF RURAL OUTDOOR RECREATION,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-10585

SOUTH DAKOTA'S SYSTEM OF WATER MANAGEMENT AND ITS RELATION TO LAND USE AND ECONOMIC DEVELOPMENT,
South Dakota Univ., Vermillion. School of Law.
For primary bibliographic entry see Field 4A.
W76-10721

COAL MINING, DEVELOPMENT AND PROCESSING -- THE ASSOCIATED WATER PROBLEMS,
Clyde and Pratt, Salt Lake City, Utah.
For primary bibliographic entry see Field 6E.
W76-10727

THE EFFECT OF CHANGING INPUT AND-PRODUCT PRICES ON THE DEMAND FOR IRRIGATION WATER IN TEXAS,
Texas A and M. Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W76-10810

A METHOD FOR DETERMINING THE IRRIGATION REQUIREMENT IN ANTIGUA, W. I.,
MacDonald Coll., Montreal (Quebec).
For primary bibliographic entry see Field 3F.
W76-10981

6E. Water Law and Institutions

STRATEGIES FOR NATURAL RESOURCE DECISION-MAKING: COMMENTS ON THE STAFF REPORT,
New England River Basins Commission, Boston, Mass.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 028, $5.00 in paper copy, $2.25 in microfiche. Report NERBC-004, December 6, 1972. 89 p, append.

Descriptors: *Decision making, *Natural resources, *Planning, *Regional development, *State governments, Programs, Land use, Social aspects, Water quality.
Identifiers: *Policy planning, *Program planning, National Land Use Policy Act, Coastal Zone Management Act, Citizen participation.

The proceedings of a conference sponsored by the NERBC on Opportunities for Coordinating Natural Resource Planning Programs, September 14, 1972 are summarized. Five formal statements are summarized along with reactions from 7 panelists and other comments received later. A national overview is given. Initiatives at the federal level are viewed in relation to their potential to re-establish government credibility and to make the bureaucracy responsive to people. These objectives are strengthened by strategies which reduce federal requirements and return control of programs to the states. Reorganization at the federal level has gone in this direction. The National Land Use Policy Act and Coastal Zone Management Act are regulatory bills which strengthen existing means of public control. Land use programs at the state level will have to be well conceived to reconcile environmental and social concerns. These bills draw attention to areas of environmental concern, key facilities, large scale development, and lands of regional benefit. Similarly the 1972 Water Quality Amendments demand that the states take action in the form of programs to stop water pollution in navigable rivers. A coordinated program of environmental planning, waste disposal, recreation, and flood control, is necessary for benefits to be large. Regional agencies can serve roles as experts, as leaders, and as a focus for integration of planning efforts. At the state level citizen participation is needed but difficult to obtain. At all

levels the question of policy versus program planning is important. (See also W76-07735) (Smith-North Carolina)
W76-10503

CONTROL OF POLLUTION FROM ANIMAL FEEDLOTS,
For primary bibliographic entry see Field 5G.
W76-10533

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT, VOLUME I,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10574

THE WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, ENFORCEMENT VOLUME II,
Environmental Law Inst., Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10575

DIPLOMATIC AND LEGAL ASPECTS OF REMOTE SENSING,
Department of State, Washington, D. C.
R. F. Stowe.
Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 2, p. 177-180, 1976.

Descriptors: *Remote sensing, *Legal aspects, *Foreign countries, Satellites(Artificial), Regulation, Treaties.
Identifiers: *International relations.

The enthusiasm generated by the Earth Resources Technology Satellite (ERTS-1) appears to be dampened by the international community due to concern about national sovereignty and unfair exploitation of natural resources, eliciting arguments that sovereignty should include complete control over all dissemination and use of information relating to natural resources, regardless of where such dissemination or use may take place. Proposals before the United Nations Outer Space Committee are being negotiated and debated on the U. S. position of open-dissemination vs. a prior-consent system. Aside from fears that national security would be threatened, particularly by the disclosure of data such as crop surveys that have economic implications, there exists a pervasive if vague and ill-defined feeling that yet another area of national if not personal privacy is being violated and that somehow this results in increased vulnerability. Efforts to find acceptable solutions to the differing views and concerns are being made in the Legal and Scientific and Technical Subcommittees of the UN. Fears have been expressed on one hand that the technological progress would outpace policy considerations, creating a fait accompli; and on the other hand, that adoption of legal standards before clarifying what is technically practicable and useful would create artificial and perhaps irrelevant guidelines to future development of remote sensing. (Auen-Wisconsin).
W76-10584

THE ECONOMICS OF DEVELOPING THE RESOURCES OF THE WORLD'S OCEANS,
Akademiya Nauk SSSR, Moscow.
For primary bibliographic entry see Field 6B.
W76-10587

WATER TO THE FIELDS: INDIA'S CHANGING STRATEGY,
Sussex Univ., Brighton (England). Inst. of Development Studies.
For primary bibliographic entry see Field 3F.
W76-10589

SETTLEMENT OF DISPUTES ARISING UNDER THE LAW OF THE SEA CONVENTION,
Ministry of Foreign Affairs, Nairobi (Kenya). Legal Div.
A. O. Adede.
American Journal of International Law, p. 798-818, 1975.

Descriptors: *Law of the Sea, *Boundary disputes, *Adjudication procedure, Equity, Treaties, Negotiations, United Nations, Foreign countries.

The efforts of the Third United Nations Conference on the Law of the Sea to adopt a comprehensive Law of the Sea Convention containing an appreciable degree of flexibility in the settlement system of disputes arising out of the Convention are discussed in connection with a series of draft articles prepared by the Informal Working Group on the Settlement of Disputes. The fundamental issues involved are first, whether or not states will indeed agree to include in the Convention a system of third-party settlement with compulsory jurisdiction; secondly, whether states will agree to submit to such compulsory procedures all disputes or only a limited category of cases. Essential to such a comprehensive system is the inclusion of wide choices of modes of settlement, incuding third-party procedures entailing binding decisios; a system that includes copsory procedures from which only limited and justifiable exceptions are permitted; a system that would ensure a wide measure of uniformity in the interpretation and application of the Law of the Sea Convention; that it should be an integral part of the Law of the Sea and not an optional protocol to the Convention; the establishment of a Law of the Sea Tribunal; and that both the substantive law of the Convention and the procedural mechanisms established therein must protect the rights and interests of all states equally. (Auen-Wisconsin).
W76-10590

NATIONAL OCEAN POLICY: PRIORITIES FOR THE FUTURE,
Committee on Commerce (U. S. Senate). Committee on Commerce National Ocean Policy Study.
E. F. Hollings.
Oceanus, Vol. 19, No. 1, p. 8-21, 1975.

Descriptors: *Oceans, *Regulation, *Natural resources, *Management, Continental slope, United States, Jurisdiction, Federal government, Resources development, Seashores, Marine fisheries, Administration, Comprehensive planning, Legislation, Institutions, Environmental effects, Submerged Lands Act, Oil, Drilling, Exploration, Contract administration, Bids, State governments, Mining.
Identifiers: *U.S. ocean policy, Outer Continental Shelf, Seabed mining, 200-mile economic zone, Outer Continental Shelf Lands Act.

The fragmented institutional jurisdiction for the management of the United States coastal zones, the Outer Continental Shelf, and seabed resources, and the absence of a comprehensive regulating policy pose an environmental and economic threat. The critical needs for developing a sound marine resource management program by the federal government are: (1) Creation of a 200-mile economic zone; (2) reassessment and reorganization of federal ocean programs; (3) revision of the Outer Continental Shelf Lands Act to reflect current national and regional values; (4) strengthening the Coastal Zone Management Act to provide the coastal states with greater capacity to deal with problems of energy facility siting and deep water ports; (5) establishment of a marine fisheries management system at the federal level; and (6) a federal policy and licensing system for seabed mining. The federal government's conscious promotion of the development of private and public natural resources through incentive policies for extraction, harvesting, and conversion of raw materials to goods based on inexaustible resources must be revised to reflect the concept of obviously limited resources. Institutions must be restructured, policy must be formulated on the basis of sustained and scientific management of the resource and more knowledge must be gained to focus on the problems of the oceans. (Auen-Wisconsin)
W76-10591

ENABLING LEGISLATION: POSSIBILITIES FOR THE COMMERCIAL FISHING INDUSTRY,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
J. C. Cato.
Staff Paper No. 8, June 1975. 20 p. 1 tab., 12 ref.

Descriptors: *Cooperatives, *Commercial fishing, *Legislation, *Florida, *Marketing, Regulation, Prices, Assessments.

How the Florida commercial fishing industry can enhance its returns by marketing orders initiated through enabling legislation is illustrated by describing what enabling legislation and marketing orders are and what they are designed to accomplish. A marketing order program promotes an orderly marketing system with concurrent price stability. Under marketing agreements and orders it is possible to improve marketing news and even sponsor research programs to help solve specific problems. Grade, size limitations, and quality controls can be used which can create buyer confidence in product quality. Marketing orders can be tailored to meet a wide range of problems, restricted only by appropriate legislation. Enabling state legislation allows fishermen to work on marketing problems cooperatively guided by simple rules. The differentiation between a marketing agreement and a marketing order is that the former is a voluntary contract between producers and handlers to follow certain rules set by enabling legislation; the latter allows fishermen to hold a referendum and vote a mandatory assessment on everyone involved in selling a particular species, for example, to try to improve their collective bargaining position in the market. The fishery enabling legislation enacted in Oregon and North Carolina are cited as examples, illustrating the legislative scope and procedures and costs of assessment. (Auen-Wisconsin)
W76-10593

OCEAN BOUNDARIES AND PETROLEUM RESOURCES,
Princeton Univ., N.J. Dept. of Geology.
H. D. Hedberg.
Science, Vol 191, No 4231, p 1009-1018, March 12, 1976. 6 fig, 9 ref.

Descriptors: *Continental Shelf, Water resources, *Boundary disputes, *Oil industry, *Environmental effects, Continental margin, Continental slope, Resources development, Management, Boundaries(Property), Drilling, Exploration, Exploitation, International law, *Law of the Sea.
Identifiers: *Outer Continental Shelf, *Petroleum resources, *Offshore drilling, Deep ocean, Geomorphic features.

The development of marine geophysical prospecting and various types of marine drilling installations suited to various water depths has now made exploration and production in shallow and moderately deep offshore waters of the continental shelf entirely feasible and, in some respects, less difficult than in some land areas. Currently, there are hundreds of offshore fields producing oil and gas in the world; 17% of U.S. production and 18% of world production in 1973 came from these offshore sources. It is recognized that there should be an outer limit to the areal extent of a coastal state's jurisdiction over the ocean floor extending outward from its shores. It is also generally agreed that the great central regions of the deep ocean

floor should be under international jurisdiction. The big problem is just how far out the boundary between national and international domains should be drawn. It is concluded that the United States has everything to gain and nothing to lose by supporting a boundary formula that gives it its natural subsea territory out to the base of the adjacent continental slope, plus such additional selvage as may be provided by whatever width boundary zone the nations-in-concert decide is desirable. Conversely, the United States would definitely lose by accepting a 200-mile limit. In several places this would deprive it of potential petroleum territory which naturally should belong to it, while in other places it would give it an excess of deep-ocean bottom poor in sediments. Perhaps, the U.S. and other countries may yet be willing to speak out for the simpler, more effective principle that gives all nations the sub-sea bottom resources that naturally belong to them through the natural prolongation of their land masses beneath the oceans. (Sinha-OEIS)
W76-10596

INTERNATIONAL CONFERENCE ON ENVIRONMENTAL SENSING AND ASSESSMENT, VOLUMES 1 AND 2.
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10637

SOME INTERNATIONAL ACTIVITIES IN ENVIRONMENTAL MONITORING,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10644

NETWORK DESIGN CONSIDERATIONS FOR THE GLOBAL ENVIRONMENTAL MONITORING SYSTEM (GEMS) OF THE UNITED NATIONS,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-10646

ENVIRONMENTAL MONITORING IN LATIN AMERICA AND THE CARIBBEAN,
Pan American Health Organization, Washington, D. C.
For primary bibliographic entry see Field 5A.
W76-10654

ENVIRONMENTAL QUALITY SURVEILLANCE IN INDONESIA,
National Inst. of Health, Research and Development, Djakarta (Indonesia).
For primary bibliographic entry see Field 5A.
W76-10655

LEGAL REQUIREMENTS FOR MONITORING GROUNDWATER QUALITY,
Banks (Harvey O.), Inc., Belmont, Calif.
For primary bibliographic entry see Field 5G.
W76-10656

OWRT INTEREST IN NEW TECHNOLOGIES FOR WATER TREATMENT,
Office of Water Research and Technology, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10677

ILLINOIS LAWS RELATING TO WATERWAYS 1973.
Illinois State Dept. of Transportation, Springfield. Div. of Waterways.
Available from Division of Waterways, Dept. of Transportation State of Illinois, 1973. 180 p.

Descriptors: *Illinois, *Administrative agencies, *Water resources development, *Legislation, *Supervisory control(Power), Water management, Water utilization, Rivers, Streams, Flood contures, Coordination, Federal government, Stae governments, Local governments, Navigation, Jurisdiction.

This booklet collects statutes pertaining to the use of rivers, lakes and streams in Illinois, and to the authority, duties and jurisdiction of the Department of Transportation and its Division of Waterways over those waters. These statutes cover a multitude of water related areas, including flood and pollution control, dam and canal construction, and the development of water resources for all types of public utilization. Reference is made to the chapters and paragraphs of the Illinois Revised Statutes, wherein can be found the complete acts from which this material has been excerpted. (Parrish-Florida)
W76-10720

SOUTH DAKOTA'S SYSTEM OF WATER MANAGEMENT AND ITS RELATION TO LAND USE AND ECONOMIC DEVELOPMENT,
South Dakota Univ., Vermillion. School of Law.
For primary bibliographic entry see Field 4A.
W76-10721

DREDGED MATERIAL DISPOSAL--EFFECTS AND ALTERNATIVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W76-10724

A NEW INTERNATIONAL LAW FOR THE DEEP SEABED REGIME,
Columbia Univ., New York. School of Law.
O. L. Lissitzyn.
Columbia Journal of Transnational Law, Vol 14, No 1, p 30-55 (1975). 26 p.

Descriptors: *Law of the sea, *United Nations, *Exploitation, Exploration, Economics, International law, Legal aspects, Navigation, Oceans, Water law, Management, Regulation, Water policy, Legislation, Foreign waters, Foreign trade, International waters, Administrative agencies, Judicial decisions, Treaties, Oil, Natural resources, Water resources, Resources development, Research and development, Boundary disputes, Political constraints, Governmental interrelations. Identifiers: Common heritage.

Efforts to arrive at a new international law of the deep sea hinge on the resolution of several key differences. Developing nations want seabed resources distributed according to the 'common heritage' principle by an international seabed authority. Developed nations, however, want the right to do their own mining for their own benefit. Also to be considered are land-based metal producers who will lose money from seabed mining, and who want broad regulatory powers. Concern exists over the domination of resources by developed nations, as well as over what type of body will ultimately govern the seabed. (Frank-Florida)
W76-10726

COAL MINING, DEVELOPMENT AND PROCESSING -- THE ASSOCIATED WATER PROBLEMS,
Clyde and Pratt, Salt Lake City, Utah.
E. W. Clyde.
Rocky Mountain Mineral Law Institute, Vol. 21, p. 163-197 (1975), 34 p, 74 ref.

Descriptors: *Water resources development, *Interstate compacts, *Central U. S., *Coals, *Water utilization, Water resources, Water requirements, Mining, Mine drainage, Electricity, Water rights, Legal aspects, Groundwater, Dams Appropriation, Energy, Power plants, Federal government.
Identifiers: *Flood Control Act of 1944.

America is looking to greatly expand its coal production. Significant quantities of water will be needed in all known coal processes. Since the water problems that will arise will be legal as well as physical, interstate agreements must be reached to provide proper apportionment. This is especially true for the states comprising the Lower Colorado River Basin. REciprocal legislation is one way to ensure cooperation; however, there are various alternatives to meet the future water needs of the West which must also be explored. For example, deep groundwater could provide some of the water needed. The author favors large, publicly-financed multi-purpose projects under the 1944 Flood Control Act. This Act allows the Secretary of the Army to make contracts among several states for water diversion or transport. Since the Federal Government has the right to transport its water as it pleases, it is up to the states to prepare for their imminent water needs by regional cooperation. Otherwise, the federal government will push through a unilateral solution for obtaining water for its energy processes. (Frank-Florida)
W76-10727

EQUITABLE APPORTIONMENT OF INTERSTATE GROUND WATERS,
Fischer and Beatty, Fort Collins, Colo.
For primary bibliographic entry see Field 4B.
W76-10728

INDIAN WATER RIGHTS: SOME EMERGING FRONTIERS,
Native American Rights Fund, Boulder, Colo.
R. S. Pelcyger.
Rocky Mountain Mineral Law Institute, Vol 21, p 743-775 (1975). 35 p, 111 ref.

Descriptors: *Indian reservations, *Pacific Northwest U. S., *Groundwater, *Groundwater resources, *Surface-groundwater relationships, Surface waters, Treaties, Legal aspects, Legal review, Federal reservations, Federal government, Federal jurisdiction, State governments, State jurisdiction, Fishing, *Water rights.

Indians in the west and northwest have encountered problems in protecting their fishing rights from state encroachment. District and circuit courts have overturned state court decisions holding against Indian fishing rights at a rapid and unanimous rate. Indian water rights also have been subject to state encroachment, but because they have long been recognized to be under federal jurisdiction, states have had much less success. The author explains the legally recognized similarities between ground and surface waters. This prefaces his stance that Indians have rights to ground waters under Federal treaties and that the needs of the reservation should be met first. (Frank-Florida)
W76-10729

AN INTEGRATED INTERNATIONAL AND DOMESTIC APPROACH TO CIVIL LIABILITY FOR VESSEL-SOURCE OIL POLLUTION,
For primary bibliographic entry see Field 5G.
W76-10730

A PROPOSAL FOR ADOPTION OF A LEGAL DOCTRINE OF GROUNDSTREAM WATER INTERRELATIONSHIP IN TEXAS,
Saint Mary's Univ., San Antonio, Tex. School of Law.
For primary bibliographic entry see Field 4B.
W76-10731

THE LAW OF THE SEA AT THE CARACAS SESSION: A BRIEF EVALUATION,
Law of the Sea Conference, New York.
H. Caminos.
Columbia Journal of Transnational Law, Vol. 14, No. 1, p 80-86 (1975). 7 p.

Descriptors: *Law of the Sea, *United Nations, *Continental shelf, *Resources development, *International law, Legal aspects, Navigation, Oceans, Water law, Management, Regulation, Exploration, Exploitation, Administrative agencies, Licenses, Permits, Treaties, Water pollution, Pollutants, Research and development, Water pollution, Boundaries(Property), Legislation, International waters, Foreign trade, Economics.
Identifiers: *Territorial seas, *Economic zones.

Transcribed here is a speech made at Columbia University describing developments within the three main committees of the Third United Nations Conference on the Law of the Sea which met in Caracas. Topics discussed by the First Committee included: who may explore and exploit international areas; the merits of a strong authority having comprehensive powrs to direct exploration and exploitation versus the merits of a weak authority licensing others to conduct these activities; conditions of exploration and exploitation and degree of control to be given to the Authority over activities in the area; and economic aspects of seabed exploitation. The Second Committee covered the traditional fields in Law of the Sea with major emphasis on the various 'package deals' proposed regarding economic zones in territorial seas. The Third Committee dealt with pollution, scientific research and transfer of technology. The speaker concluded that there is a need for more negotiation and cooperation if unilateral action regarding seabed resources is to be avoided. (Hadoulias-Florida)
W76-10732

THE THIRD U. N. LAW OF THE SEA CONFERENCE: MAJOR UNRESOLVED FISHERIES ISSUES,
National Oceanic and Atmospheric Administration, Washington, D. C. Task Force on the Law of the Sea.
G. Taft.
Columbia Journal of Transnational Law, Vol. 14, No. 1, p. 112-17 (1975). 6 p.

Descriptors: *Fish conservation, *Marine fisheries, *Anadromous fish, *Catadromous fish, *International commissions, Law of the sea, Foreign waters, Treaties, International waters, Conferences, Commercial fish, Fish management, Fish populations, Fish harvest, Marine fish, Foreign waters, Coasts.
Identifiers: Coastal waters, Contiguous zone, Economic zone.

Broad general agreement exists within the Third United Nations Conference on the Law of the Sea that a 200-mile economic zone be established. This article focuses on six specific unresolved issues: coastal state duties within the zone; special treatment of anadromous species; special treatment of migratory species; right of landlocked and geographically disadvantaged nations; provisional treaty application; and coastal state enforcement jurisdiction. Developing nations favor exclusive coastal nation rights with exclusive enforcement jurisdiction and without international conservation or utilization duties. Furthermore, these states favor no special treatment for any fish species. The United States favors exclusive coastal state regulation with accompanying obligation to conserve and utilize resources and with limited coastal enforcement jurisdiction. The United States also favors special anadromous and migratory species treatment. Western European nations adopt a middle position, stressing regional or sectoral fisheries together with coastal state rights and duties. Landlocked nations present special problems. It is generally agreed that these states have access rights; however, the extent of the right is unclear. A compromise solution satisfactory to all the various states will not be easily found. Nonetheless, the need for immediate protection of ocean resources will probably result in a tentative treaty being adopted soon. (Comer-Florida)
W76-10733

THE ROLE OF THE COASTAL ZONE MANAGEMENT ACT OF 1972 IN THE DEVELOPMENT OF OIL AND GAS FROM THE OUTER CONTINENTAL SHELF,
Morgan, Lewis and Bockius, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10734

ENERGY CRISIS, SUPERTANKERS AND ECOLOGY,
For primary bibliographic entry see Field 5G.
W76-10735

THE CONVEYANCER, WATER RIGHTS AND THE ENVIRONMENT,
F. M. Brookfield.
The New Zealand Law Journal, Vol. 1975, p. 645-50. 6 p.

Descriptors: *Water rights, *Water allocation(Policy), Foreign countries, *Relative rights, Legislation, Diversion, River regulations, Legal aspects, Water law, Administrative agencies, Jurisdiction, Regulation, Common law, Administration, Water policy, Water conveyance, Governments, Public rights, Water.
Identifiers: *New Zealand, *Water and Soil Conservation Act of 1967(NZ), Water rights(Non-riparian), Conveyancers.

Prior to the Water and Soil Conservation Act of 1967, common law rights in New Zealand consisted of two classes: natural rights of the landowner, and acquired rights. These rights, which include both the right to take and discharge water, are examined to determine the extent which they are affected by the 1967 Act. Special emphasis is placed on section 21(1) of the Act which takes and vests in the Crown certain rights as to 'natural water', including the right to take and use natural water and to discharge natural water into natural water. The right to convey water, however, is not taken by the Crown. Sections 24 and 25 of the Act dealing with priorities among competing rights and interests along with other remedies before the Act are also examined. Finally, the article discusses the duties of the conveyancer both before and after passage of the Act. (Griffith-Florida)
W76-10736

WATER QUALITY AND THE WATER AND SOIL CONSERVATION ACT 1967,
For primary bibliographic entry see Field 5G.
W76-10737

DAMS OF PORK,
For primary bibliographic entry see Field 6B.
W76-10738

BURNING WATERS,
For primary bibliographic entry see Field 5G.
W76-10740

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10741

A SOUND WATER PLAN FOR SOUTH FLORIDA IMPLEMENTATION OF THE 1972 WATER RESOURCES ACT,
Spessard L. Holland Law Center, Gainesville, Fla.
F. E. Maloney.
Florida Environmental and Urban Issues, Vol. 1, No. 4, p. 1-4 (1974). 4 p, 1 photo.

Descriptors: *Florida, *Water management(Applied), *Water conservation, *Water districts, *Planning, Water resources, Administrative agencies, Flood control, Water pollution, Groundwater resources, Groundwater movement, Groundwater potential, Water supply, Surface water availability, Legislation, Regulation, Control, Groundwater management, Water policy, Project planning, Projet purposes, conservation, Water allocation(Policy), Permits, Water storage, Water quality, Water resources development, Water utilization.
Identifiers: *Florida Water Resources Act(1972).

South Florida needs development of a sound long-range water plan to meet emerging water resources problems, enforced by an agency with knowledge and power to do so fairly and equitably. The Central and Southern Florida Flood Control District when created did not deal with water pollution. In 1972, however, the Florida Resources Act, based upon the Model Water Code, converted the Flood Control District into a true Water Management District with full authority to control both surface and groundwater. The Act also charged the District with developing long-range plans for use of Florida's water resources and with conserving and preserving water resources in the public interest. The Act calls for either the Water Management District or Department of Natural Resources to devise and promulgate detailed rules and regulations for implementation of general water management. These rules should specify procedures for obtaining permits for use, management and storage of water, and design criteria for wells. Problems remaining to be solved include: increasing urban concentrations; disposal of municipal and industrial water, reuse of treated water; backpumping problems; protection of wildlife in the Everglade National Park and the FCD Conservation Areas; and rampant development. (Hadoulias-Florida)
W76-10742

U. S. POSITION ON LAW OF THE SEA REVIEWED,
J. N. Moore.
Department of State Bulletin, Vol 70, p 397-402, April 15, 1974. 6 p.

Descriptors: *United States, *Law of the sea, *Treaties, *Continental shelf, *Water resources development, International law, Legal aspects, Foreign trade, Foreign waters, International waters, Commercial fishing, United Nations, Navigation, Straits, Navigable waters, Fish, Anadromous fish, Fish management, Jurisdiction, Continental margin, Resources, Resources development, Water pollution, Oil pollution, Research and development, Legislation.
Identifiers: *Territorial zone, Arbitration.

The Chairman of the National Security Council Task Force on the Law of the Sea has summarized the United States position on the following crucial issues confronting the Law of the Sea Conference: (1) The United States has agreed to a twelve mile territorial zone provided rights of unimpeded transit through straits used for international navigation are recognized by international treaty; (2) To meet the problem of management jurisdiction over fish stocks, the U. S. has proposed broad coastal state control over coastal and anadromous species. The U. S. has also urged broad jurisdiction over continental margin mineral resources; (3) Development of deep seabed resources will be best accomplished by allowing access to such resources under reasonable conditions set by international administrative machinery. In addition, international standards are needed to regulate vessel pollution. Finally the United States has proposed the creation of a new ocean tribunal calling for compulsory third-party settlement of

disputes arising under the treaty. (Hadoulias-Florida)
W76-10743

DEPARTMENT OPPOSES UNILATERAL EXTENSION OF U. S. FISHERIES JURISDICTION,
Department of State, Washington, D. C.
K. Rush.
Department of State Bulletin, Vol. 70, p. 555-558, May 20, 1974. 4 p.

Descriptors: *Legislation, *Federal jurisdiction, *Law of the Sea, *Fisheries, *Commercial fishing, International law, Federal government, Water law, Treaties, Governments, Regulation, Political aspect, Legal aspects, Jurisdiction, Water rights, Foreign waters, Foreign trade, International waters, Atlantic Ocean, Pacific Ocean, Governmental interrelations.

The executive branch is opposed to Senate bill S. 1988, which calls for unilateral extension of U. S. fisheries jurisdiction to 200 miles, because of serious foreign policy implications. It is feared that the establishment of a 200 mile zone would be very difficult to enforce and could possibly frustrate satisfactory settlement of other aspects of the fisheries question at the Law of the Sea Conference. Other critics of the bill claim it would impair U. S. international credibility, prejudice short and long term interests of American distant-water fishermen, and set a precedent contrary to established principles of international law. During the interim period prior to establishment of a new international legal system by the Law of the Sea Conference, ways to solve the fisheries problem, including the strengthening of both bilateral and multilateral agreements with nations conducting fishing operations, will be undertaken. (Hadoulias-Florida)
W76-10744

THE OCEANS: WILD WEST SCRAMBLE FOR CONTROL,
Time, Vol. 104, p 51-54, July 29, 1974. 4 p, 1 map, 1 illus, 1 photo.

Descriptors: *Law of the Sea, *Treaties, *International law, *Resource development, *Continental shelf, United Nations, Boundary disputes, Regulation, Federal government, Foreign trade, International waters, Navigation, Transportation, Licensing, Fisheries Commercial fishing, Administrative agencies, Legislation, Pollution, Water resources, Administration, Economics, Governments, Management, Political aspects, Jurisdiction, Foreign waters, Exploitation, Mining, Leases, Exploration.
Identifiers: Territorial zone, Economic zone.

The major issues discussed at the Caracas Law of the Sea Conference included: the boundaries for coastal nation territorial zones and economic jurisdiction; ownership of high seas resources; and creation of an international association settling ocean disputes and parceling out resources. The Conference split into two factions with the 120 developing countries generally squared off against the 29 modern industrial nations. The United States, having much to lose at Caracas if satisfactory laws are not developed, has urged that coastal nations be given a twelve mile territorial sea, a 200 mile wide 'economic zone' for exploitation of minerals and fish, and control over anadromous and coastal fish species except for certain licensing rights granted to foreigners and an international fishing commission in charge of wide-ranging oceanic species. The international authority would set up rules for deep sea mining, license qualified miners, and collect 5% of revenues for distribution to non-coastal or needy nations. The Caracas delegates have chosen to sidestep the issue of pollution. Nevertheless, the Caracas Conference represents a global attempt to steer away from a 'colonial mentality' by setting fair ground rules for sharing the oceans resources. (Hadoulias-Florida)
W76-10745

HERE COME DE SLUDGE,
G. Soucie.
Audubon, Vol. 76, p. 108-113 July 1974. 6 p, 1 illus, 1 map.

Descriptors: *Sewage sludge, *Sludge disposal, *New York, Sludge treatment, *Organic wastes, Industrial wastes, Sewage, Sludge digestion, Solid wastes, Wastes, Waste disposal, Environmental sanitation, Municipal waters, Water quality, Water pollution, Federal government, Governmental interrelations, Administrative agencies, Ecology, Water quality control, Environmental effects, Regulation.
Identifiers: *New York Bight.

Sewage sludge, dredge spoils, construction rubble, derelict vessels and industrial wastes are being dumped in the waters of the New York Bight producing changes in area marine life, public health hazards, and concentrations of heavy metals in offshore waters. Federal responsibility for sludge dumping is shared by (1) the Environmental Protection Agency (EPA), in charge of issuing permits and monitoring acute, short-term effects, (2) the National Oceanic Administration (NOAA), for delineating the long-term environmental impact, defining the extent of present dumping grounds, and for selecting alternative sites, and (3) the Coast Guard for policing the vessels and barges doing the dumping. The EPA does not see any other immediate alternatives to ocean dumping since incineration adds additional dirty air and releases aerosols of toxic heavy metals while composting of sludge for fertilizers is economically unfeasable. The EPA suggests a bi-state regional sludge management authority to seek alternatives such as pipelines to remote landfills, regional incineration with energy recovery, or advanced treatment processes. Presently the EPA has succeeded in getting the NOAA to identify two alternative dumping areas further out at sea. (Hadoulias-Florida)
W76-10746

THE GREAT MAINE LOBSTER WAR,
G. Soucie.
Oceans, Vol. 74, p. 66-68, May 1974. 3 p.

Descriptors: *Oil pollution, *Lobsters, *Maine, *Canada, *New Hampshire, *Boundary disputes, Treaties, Fisheries, Fishing, Continental Shelf, Oil, Resources, Oil spills, Benefits, Economics, Legal aspects, Political aspects, Water rights, Water law, Costs, Marine fish, Marine fisheries, Commercial fishing, Boundaries(Property).
Identifiers: *Great Maine Lobster War, *Machias Seal Island.

Maine is feuding over marine boundaries with both her neighbors, Canada and New Hampshire, in what has become known as the Great Maine Lobster War. The Canadian-Maine dispute centers around the still unsettled question of the boundaries and ownership of Machias Seal Island and neighboring North Rock. The Maine-New Hampshire boundary dispute centers around whether the line connecting the harbour midpoints mentioned in the King's Order of 1740 is a straight or curved line. Reasons for recent flare-ups include cost-price squeeze, declining catches, and competition from large foreign fishing fleets. The offshore areas in dispute between Maine, New Hampshire and New Brunswick are prime lobstering areas. Furthermore, oil companies have been exploring the whole Atlantic Continental Shelf thereby adding problems of oil spills and well blowouts to existing problems and issues. Regarding the Maine-Canada dispute, Maine has several deepwater coves and harbors coveted by the oil industries as potential tanker ports and refineries. Since Canada will not permit tankers bound for the U. S. to sail through Canadian waters because of pollution problems, ownership of Machias Seal Island is crucial to Maine. (Hadoulias-Florida)
W76-10747

THE NEW TREATY ON VESSEL POLLUTION,
R. J. McManus.
Oceans, Vol 74, p 59-65, July 1974. 7 p, 35 ref.

Descriptors: *Oil pollution, *Treaties, *International law, *United Nations, *Ships, Water pollution sources, International waters, Water pollution, Oil, Foreign waters, Water law, Pollutant identification, Water pollution control, Water pollution abatement, Legal aspects, Law of the sea, Oil industry, Political aspects, Water policy, Organization, Foreign countries, Governments.
Identifiers: 1973 Convention for the Prevention of Pollution from Ships.

The 1973 Conference on Marine Pollution was convened in England by the Intergovernmental Maritime Consultative Organization (IMCO), the specialized United Nations agency that regulates and coordinates world shipping. A new treaty, The Convention for the Prevention of Pollution from Ships, 1973, resulted. The treaty is primarily concerned with the incidental discharge of hazardous and polluting substances in the normal course of ocean commerce. The treaty basically requires each signatory nation to enact domestic legislation at least as stringent as the regulations set forth in the treaty concerning domestic ships. Annex I of the treaty regulates discharges of oil in five special areas. Annex II categorizes every noxious liquid substance carried in bulk. Annex III requires contracting parties to issue requirements for packing, labeling and storing harmful substances. Annexes IV and V deal with vessel sewage and garbage. Other treaty provisions include maritime treaties for warships, compulsory arbitration and tacit amendment procedures. Although the treaty relies upon enforcement by flag states, coastal states are granted authority to act if supplementary action is necessary. (Hadoulias-Florida)
W76-10748

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 2).
Hearings--Sub Comm on Pub Lands--Comm on Interior and Insular Affairs, U. S. Senate, February 7, 1974, p 75-220.

Descriptors: *Rivers, *Licensing, *Water resources development, *North Carolina, *Wild Rivers Act, Federal government, Governmental interrelations, Projects, Conservation, Hydroelectric project licensing, Hydroelectric plants, Legal aspects, Electric power, Conservation, Costs, Planning, Resources development, Scenery, Project purposes, Ecology, Recreation facilities, Protection, Water quality.
Identifiers: *Wild and Scenic Rivers Act, Upper New River, Blue Ridge Project.

The Wild and Scenic Rivers Act authorizes Congress to conduct studies to designate qualifying rivers as additions to the Wild and Scenic Rivers System. The Federal Power Commission is prohibited from licensing construction of any water project directly affecting the rivers until such studies have been completed. This bill proposes that Congress include portions of the New River of North Carolina into the System because of outstanding scenic, recreational, geologic and historic values. The Federal Power Commission (FCC), however, may frustrate such inclusion by granting a license for construction of the Blue Ridge Project, a massive hydroelectric project which would destroy the Upper New River. Thus, if this bill is not immediately approved Congress may lose the opportunity to determine the proper use of this remarkably beautiful and historic area. The Environmental Protection Agency carefully evaluated the Blue Ridge project and determined that the Project's benefits do not outweigh its disadvantages which include the uprooting of North Carolina citizens, adverse

affects on reservoir water quality, and adverse impacts in stream biota. (Hadoulias-Florida)
W76-10750

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 4).
Hearings--Sub Comm on Pub Lands--Comm on Interior and Insular Affairs, U. S. Senate, June 20, 1974, p 493-771.

Descriptors: *Wild rivers, *Wild River Act, *Recreation, *National parks, *Water resources development, Bodies of water, Rivers, Scenery, Water policy, Boating, Water sports, Natural resources, Recreation demand, Recreation facilities, Social impact, Water utilization, Wildlife, Interstate rivers.

The Act which created the National Wild and Scenic River System originally obligated the Department of Interior to study 27 rivers to determine priorities for inclusion into the System. This 1974 hearing report contains proposed bills which would designate additional rivers or segments of rivers as components of the system. Statements were made before the committee by the following interested parties: elected officials, representatives of conservation groups, and members of state and national agencies involved in the administration of the program. Additional material considered by the committee included maps and photographs of the areas under consideration, newspaper articles, and letters from local officials and from owners and users of land to be acquired or rezoned under the proposed legislation. The proponents of the legislation were primarily concerned with bringing the additional land and water into the federal system, as state and local financial resources seemed generally inadequate to provide for maintenance of the areas for recreational and aesthetic purposes. Landowners in some areas opposed certain of the bills, as did the Department of Interior, which suggested a substitute list of rivers. (Sloan-Florida)
W76-10751

TO AMEND THE WILD AND SCENIC RIVERS ACT (PART 5).
Hearings--Sub Comm on Pub Lands--Comm on Interior and Insular Affairs, U. S. Senate, August 15, 1974, p. 773-96.

Descriptors: *Michigan, *Wisconsin, *Rivers, *Hydroelectric plants, *Wild River Act, Legislation, Federal government, Dams, Islands, Power system operation, Operating costs, Operation and maintenance, Electric power demand, Structures, Facilities, Conservation, Preservation, Economics, United States, Land appraisals, Land use, Oregon.
Identifiers: *National Wild and Scenic River System.

H. R.3903 would authorize and direct the Secretary of the Interior to convey to the Wisconsin Michigan Power Company of Milwaukee, Wisconsin, all right, title and interest of the United States in an island of Iron County, Michigan, upon payment of the fair market value of the land, plus administrative costs. The Company has claimed that it obtained clear title to the island when it took possession of the island in 1917 for the purpose of constructing and operating a dam and hydroelectric power plant. The island is essential for continued operation of the hydroelectric plant. When the Company filed a Color of Title claim the application was denied due to lack of basis. The Power Company is presently operating under license of the Federal Power Commission. H.R.3903 will further the policy of the National Resource Land Management Act using public lands to best serve the public. Also included in these Hearing records is discussion held on S.3835, a bill which would designate the John Day, the Minam, and the Owyhee Rivers, all of Oregon, as 'potential additions' to the National Wild and Scenic Rivers System. (Hadoulias-Florida)
W76-10752

LAWYERS AND ECOMANAGEMENT,
Puerto Rico Univ., Mayaguez. Inst. for Policy Studies and Law.
J. Mayda.
Louisiana Law Review, Vol. 34, p. 975-92 (1974). 18 p, 3 append.

Descriptors: *Legal aspects, *Social function, *Social needs, *Human resources, *Ecosystems, Soil conservation, Water conservation, Wildlife conservation, Natural resources, Economics, Social impact, Psychological needs, Social change, Social adjustment, Social values, Planning.

Pollution of water, air, earth and living resources has reached dangerous levels. Technological developments and growth economics have endangered as well as aided man and his environment. Lawyers have a vital role to play both as citizens and as practitioners of all areas of law, in reducing the dangers of technoculture. Lawyers must go beyond the development of new law to curb pollution; they must learn to develop policy and to use old concepts to reach new results. For example, in 1966 a law passed in 1899 was successfully used to convict a major oil company of oil pollution in navigable waters. In 1972 an Ohio trial court issued a permanent injunction against an air polluting industry on the basis of hundred year old public nuisance statute. The author concludes that in addition to the drafting of new and the enforcement of old anti-pollution laws, lawyers must lead the way in striking a balance between pollution and progress. (Comer-Florida)
W76-10753

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION: COASTAL ZONE MANAGEMENT PROGRAM, ADMINISTRATION GRANTS, ALLOCATION OF SECTION 306 FUNDS TO STATES,
National Oceanic and Atmospheric Administration, Washington, D. C.
R. L. Carnahan.
Federal Register, Vol. 40, No. 104, p. 23274-75, May 29, 1975. 2 p.

Descriptors: *Project planning, *State governments, *Coasts, *Continental shelf, *Oil industry, Federal government, Water resources, Leases, Programs, Project benefits, Project feasibility, Economic feasibility, Economic impact, Regulation, Political aspects, Income, Costs, Coastal engineering, Monetary benefit, Beds under water.
Identifiers: *Coastal Zone Management Act, Seabed.

Pursuant to section 306 of the Coastal Zone Management Act of 1972, interim regulations are established setting forth procedures for allocating 1975 coastal zone management programs administrative grants to state governments. Section 306 authorizes the Secretary of Commerce to make annual grants to any coastal state for administration of state coastal zone management programs provided the following requirements are met: such grants do not exceed 66 2/3% of the yearly cost of administering the program; grants from other federal sources do not supply the state's share of costs; and grants are not awarded for less than 1% of the amount so appropriated. These annual grants, which total $2.1 million, will be awarded to qualifying programs after consideration of such factors as the extent and nature of the shoreline area covered by the plan and the population of the area. Future procedures for fund allocation may differ. (Hadoulias-Florida)
W76-10754

COASTAL ZONE MANAGEMENT PROGRAM DEVELOPMENT GRANTS, OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Washington, D. C.
R. R. Hagemeyer.
Federal Register, Vol. 40, No. 104, p. 23275-78, May 29, 1975. 4 p.

Descriptors: *Project planning, State governments, Monetary benefits, *Continental shelf, *Oil industry, Federal government, Water resources, Leases, Oil, Gases, Programs, Project benefits, Project feasibility, Economic feasibility, Economic impact, Regulation, Political aspects, Appropriation, costs, Environmental effects.
Identifiers: *Coastal Zone Management Act, *Outer Continental Shelf.

Section 305 of the Coastal Zone Management Act of 1972 authorizes annual grants to coastal states to provide assistance in administering management programs for the land and water resources of their coastal zones. These grants are designed to improve state capabilities in planning for and managing projected environmental impacts resulting from the Department of the Interior's plans to lease extensive offshore seabed tracts on the Outer Continental Shelf (OCS) for the purpose of oil and gas exploration. Although the grants do not mandate specific work elements to be funded, these interim regulations present numerous examples of projects which will be considered eligible for the grants. Because of the adverse effects oil exploration might have on local communities, it is suggested that state and local governments work closely in developing acceptable work projects. The regulations also set forth procedures for fund allocation based upon a supplemental appropriation formula providing uniform allocation of 1% of available funds to affected states, and variable allocation of the balance of the funds. Funds not obligated by the end of 1975 will remain available for future disbursement. (Hadoulias-Florida)
W76-10755

MATERIALS TRANSPORTATION BUREAU: TRANSPIRATION OF NATURAL AND OTHER GAS BY PIPELINE,
For primary bibliographic entry see Field 5G.
W76-10756

NEW SOURCE NPDES PERMITS PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 6G.
W76-10757

MARINE SANITATION DEVICE STANDARD,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10758

SOAP AND DETERGENT MANUFACTURING CATEGORY PRETREATMENT STANDARDS FOR NEW SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10759

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY, PROPOSED PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10760

TIMBER PRODUCTS PROCESSING POINT SOURCE CATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.

W76-10761

ENVIRONMENTAL PROTECTION AGENCY: POLICIES AND PROCEDURES FOR STATE CONTINUING PLANNING PROCESS,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10762

PREPARATION OF STATE WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10763

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA SUBCATEGORY,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10764

ENVIRONMENTAL PROTECTION AGENCY: GRANTS AND OTHER FEDERAL ASSISTANCE, STATE AND LOCAL ASSISTANCE.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10765

DEEPWATER PORT SITE EVALUATION,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10766

DEEPWATER PORTS: LICENSING PROCEDURES AND DESIGN CONSTRUCTION, EQUIPMENT AND OPERATIONS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10767

FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES FOR EXISTING SOURCES AND STANDARDS FOR NEW SOURCES FOR THE PHOSPHATE SUBCATEGORY,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10768

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, ETHYLENE OXIDE, ETHYLENE GLYCOL, METHYL AMINES AND OXO CHEMICALS PROCESSES,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10769

WATER PROGRAMS SECONDARY TREATMENT INFORMATION,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10770

DOMESTIC WASTEWATER DISINFECTION, SECONDARY TREATMENT,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W76-10771

OIL POLLUTION PREVENTION,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10772

IDENTIFICATION OF SPECIAL HAZARD AREAS LIST OF COMMUNITIES WITH SPECIAL HAZARD AREAS,
Federal Insurance Administration, Washington, D. C.
For primary bibliographic entry see Field 6F.
W76-10773

INK FORMULATING POINT SOURCE CATEGORY, PRETREATMENT STANDARDS FOR EXISTING SOURCES,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10774

H.R. 5952 (WATER RESOURCES PLANNING ACT),
U. S. Code Cong and Admin News, p. 2415-19, 1975. 5 p.

Descriptors: *Water Resources Planning Act, *Water resources development, *Budgeting, Expenditures, U. S. Water Resources Council, Jurisdiction, Costs, Resources, Resources development, Economics, Federal budget, Federal government, Governmental interrelations, Legislation, Governments, Administration, Water law.
Identifiers: *Congressional hearings.

The Committee on Interior and Insular Affairs has recommended that H.R. 5952 be enacted as amended. H.R. 5952 would amend the Water Resources Planning Act by revising the membership of the Water Resources Council. It would also affect appropriations authority in two ways: (1) by extending the authorization for state planning grants through fiscal year 1978 at the level of $5,000,000 per year; and (2) by extending the authorization for national assessments and coordination of River Basin plans in the total amount of $10,000,000 for fiscal years 1976 and 1977. Membership of the Water Resources Council is adjusted more nearly to conform to present responsibilities within the Executive Branch. This is accomplished by dropping the Secretary of Health, Education, and Welfare from full voting membership, and by adding the Secretaries of Commerce, Housing and Urban Development, and Transportation, as well as the Administrator of the Environmental Protection Agency. The legislation also authorizes compensation of expert consultants to the council and the River Basin Commissions at the prevailing salary for GS-18 instead of the present flat rate of $100 per day. (Reinders-Florida)
W76-10775

WATER RESOURCES PLANNING ACT,
U. S. Code Cong. and Admin. News, Public Law 94-112; 89 Stat. 575, 1975. 1 p.

Descriptors: *Water law, *Water Resources Planning Act, *Administration, *Grants, Legislation, Resources development, Economics, Federal government, Administrative decisions, Costs.
Identifiers: *Congressional hearings.

The Water Resources Planning Act of 1965 has been amended. The sections amended are: Section 101 concerning Water Resources Council membership; sections 105(a)(5) and 205(a)(4) concerning per diem payments; section 301(a) concerning grant extensions; and section 401(c) concerning appropriation authorizations for fiscal years 1976 and 1977. (Reinders-Florida)
W76-10776

ENVIRONMENTAL IMPROVEMENT AUTHORITIES ACT OF 1969 (FORMATION OF PUBLIC CORPORATIONS TO DEAL WITH POLLUTION),
Ala. Code tit 8 secs 270 thru 287 (Cum Supp 1973).

Descriptors: *Alabama, *Institutions, *Pollution abatement, State jurisdiction, Administrative agencies, Water pollution control, Air pollution, Water pollution treatment, Water quality control, Water resources development, Water pollution sources, Water quality standards, Water policy, Legislation.

Through statutory enactment, the Alabama legislature has authorized the formation of public corporations whose purpose is to promote studies of environmental pollution problems, to acquire and use equipment and facilities for controlling or preventing pollution, and to aid governmental and private entities in undertakings related to pollution control. Formation of such corporations requires a showing that no other public corporation is authorized to carry on activities of the same nature within the proposed geographic area. Certificate of incorporation requires an executive order of the governor. The corporation is granted normal corporate powers; in addition, it may engage in watershed improvement, exercise eminent domain power and cooperate with governmental agencies in pollution control activities. The activities of such corporations, insofar as they concern pollution prevention and control, are declared immune from tort liability and are exempt from state taxation. Furthermore, the authorities may issue bonds provided all moneys received are used solely for pollution purposes and incidental expenses. (Comer-Florida)
W76-10777

BEAR CREEK DEVELOPMENT AUTHORITY,
Ala. Code tit 55 secs 373(6x) thru 373(6pp) (Cum Supp 1973).

Descriptors: *Alabama, *Legislation, *River basin development, *Groundwater development, *Watershed management, Comprehensive planning, River basin commissions, State governments, Administrative agencies, Water resources development, Water policy, Water supply development, Surface waters, Subsurface waters, Land resources, Natural resources.
Identifiers: Bear Creek Development Authority(Ala).

To promote unified development of Bear Creek and its tributaries, the Alabama legislature has authorized the establishment of a watershed development authority. The authority shale be a public corporation and a political subdivision. Powers granted include the power to formulate and execute development plans considering area and statewide economic development, the power to acquire property by lease, purchase, gift condemnation or otherwise, and normal corporate powers. The authority is exempt from taxation and is empowered to issue bonds. While the authority is independent of other political subdivisions of the state, it is required to report annually to the governor. The purposes of the development authority include: water conservation and supply, flood control, irrigation, industrial development, public recreation, and navigation development in the watershed area. (Comer-Florida)
W76-10778

STATE WATER CONTROL BOARD--AUTHORITY TO INVESTIGATE ALL PROBLEMS CONCERNED WITH THE QUALITY OF WATER,
1973-1974 Op Att'y Gen Va 82-84. 3 p.

Descriptors: *Virginia, *Erosion control, *Land management, *Sedimentation, *Local governments, State governments, Legislation, Planning, Water policy, Water law, Pollution control, Pro-

ject planning, Administration, Water management(Applied), Water control, Sedimentation, Water quality control, Land management, Soil management, Watershed management.
Identifiers: Implementation, State control boards(Va), Land-use control.

The State Water Control Board has the duty and the authority to exercise general supervision and control over the quality of all state waters. Furthermore, the Board has the duty and authority to study and investigate all problems concerned with the quality of state waters. Lacking unlimited resources, any decisions by the Board relating to the investigation and regulation of problems caused by pollution should be made within the context of the Board's overall responsibilities and available resources. The Board must determine, as matters of policy and priority, which problems merit investigation and whether its resources are adequate to conduct such investigations. The Virginia Erosion and Sediment Control Law is designed to minimize erosion and sediment problems within State watersheds and to mandate the development of a state-wide control program. Local governing bodies are charged with the responsibility of implementing this control program. The application by local governing bodies of land-use control measures is believed to be the most effective means by which erosion and sediment damage can be minimized. (Reinders-Florida)
W76-10779

POLLUTION--ASSEMBLY BILL 128--TO CREATE A SYSTEM OF STATE DISCHARGE PERMITS CONGRUENT WITH NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM,
1973 Op Att'y Gen Wisconsin 115-18. 4 p.

Descriptors: *Wisconsin, *Federal Water Pollution Control Act, Municipal wastes, *Permits, Waste treatment, Pollutants, Financing, Government finance, Water pollution control, Pollution abatement, Intergovernmental relations, Water pollution sources, Water pollution treatment, State jurisdiction, Federal jurisdiction, Legislation, Waste disposal, Discharge(Water), Water quality.
Identifiers: *National pollutant discharge elimination system, *FWPCA Amendments of 1972, Administrative regulations.

Wisconsin Assembly Bill 128, designed to create a system of state discharge permits congruent with the National Pollutant Discharge Elimination System (NPDES), cannot be amended to tie deadlines under the State law to the availability of federal financial assistance for municipalities without violating the Federal Act. Under the NPDES the federal Environmental Protection Agency (EPA) is to administer a system of permits for all discharges of pollutants to waters of the United States. Section 402(b) of the Act, however, provides that the system of discharge permits can be administered by the states provided they fulfill certain conditions. The EPA cannot approve a state discharge permit program unless state law provides for minimum standards and time limits that are at least as stringent as those promulgated under the federal act. (Reinders-Florida)
W76-10780

ZONING--FLOOD CONTROL.
1973 Op Att'y Gen Wisconsin 264-69. 6 p.

Descriptors: *Wisconsin, *Flood plain zoning, *Local governments, *Intergovernmental relations, *Adoption of practices, Regions, Urban hydrology, Water utilization, Legal aspects, Regulation, Legislation, Control, Water law, Water zoning, Project planning, Land use, Non-structural alternatives.
Identifiers: Shorelands.

County floodplain zoning ordinances may be adopted under the authority of Wisconsin statute 59.971. Such ordinances will not require the approval of town boards in order to become effective within the unincorporated areas of a county. The legislature has evinced an intent that counties act quickly to adopt zoning ordinances to protect their shorelands and floodplains, without the inherent delay and incompleteness that results by requiring town board approval. Thus county floodplain zoning ordinances adopted by the Department of Natural Resources pursuant to section 87.30 do not need approval of town boards in order to become effective within all unincorporated county areas. (Reinders-Florida)
W76-10781

WATER POLLUTION--CIVIL REMEDIES.
1973 Op Atty Gen Wisconsin 101-7. 7 p.

Descriptors: *Wisconsin, *Legal aspects, *Nuisance(Water law), *Penalties(Legal), *Riparian rights, Water pollution, Property values, Evaluation, Water quality, Lakes, Riparian land, Water law, Public health, Equity, Judicial decisions, Public rights, Riparian waters.
Identifiers: Citizen suits, Injunctive relief, *Water rights(Non-riparians), Nuisance(Legal aspects), Standing(Legal).

Polluters can be forced to pay damages for pollution of a Wisconsin lake to a person owning or having some lesser interest in land on or near the affected body of water; however, the damage suffered by such person must be different in type and degree from that suffered by the public in general. It is doubtful that a member of the public not in the above category could recover damages. Damages can be recovered for reduced property values, increased health hazards, reduced water quality and generally impaired use of lakes, although the recovery most likely will be in the name of reduced property values. The Wisconsin Supreme Court has repeatedly couched the riparian owner's cause of action not in terms of a riparian right per se, but in terms of a nuisance action in which the riparian has a particular interest. The nuisance alleged can be either public or private; both are viable causes of action so long as the injury to the plaintiff is particular to him. (Reinders-Florida)
W76-10782

NATURAL RESOURCES, DEPT OF; NUISANCES: WATER.
1974 Op Att'y Gen Wisconsin 260-67. 8 p.

Descriptors: *Wisconsin, *Cities, *Chemcontrol, *Jurisdiction, Governmental interrelations, Nuisance(Water law), Political aspects, Permits, Local governments, Regulation, Administration, Water law, Legal aspects, Riparian rights, Reasonable use, Legislation, Water quality, Water pollution sources, Municipal water.
Identifiers: Administrative regulations, Licenses, Nuisance(Legal aspects), Standing(Legal).

The Wisconsin Department of Natural Resources (DNR) has the authority to grant a permit to chemically control aquatic nuisances not withstanding a municipal policy contrary to such treatment. Municipalities have no jurisdictional authority to prevent the issuance of permits to riparian owners for chemical treatment of adjacent waters. Thus, the City of Madison could not prevent a riparian owner outside the city limits, acting under DNR supervision, from treating his shoreline with weed-killing chemicals. Applications for permits to chemically treat aquatic nuisances may, however, be denied even though statutory and regulatory requirements have been met if such chemical treatment would be counterproductive in achieving the goals set out in section 144.025(1) of the Wisconsin Statutes. The decision to grant or deny permits is subject to judicial review. (Reinders-Florida)
W76-10783

DRAINAGE DISTRICTS.
1974 Op Att'y Gen Wisconsin 355-61. 7 p.

Descriptors: *Administrative agencies, *Wisconsin, *Governmental interrelations, Drainage programs, Institutions, Water districts, Dams, Navigable waters, Soil conservation, Erosion control, Regulation, Administration, Water law, Water control, Nonstructural alternatives, Legal aspects, Political aspects, Local governments.
Identifiers: Dam effects.

In answer to questions regarding drainage districts in Wisconsin, the State Attorney General has stated that the powers of the drainage district board are not superseded by the shoreline zoning board or the Department of Natural Resources. However, drainage ditches which are navigable do come under the jurisdiction of the Department of Natural Resouces, except for those navigable waters which are involved in certain specified agricultural uses of land. Although soil conservation districts and drainage districts are created for a different purpose, some activities of both accomplish similar ends. For this reason, each district retains control over those activities which it undertakes for the purposes for which it was created. Even so, the Department of Natural Resources determines dam regulations for dams on drainage ditches, regardless of the purpose of the dam. In support of these conclusions, the Attorney General cites various sections of the Wisconsin Statutes. (Reinders-Florida)
W76-10784

NAVIGABLE WATERS: RIPARIAN RIGHTS.
1974 Op Att'y Gen Wisconsin 445-52. 8 p.

Descriptors: *Wisconsin, *Navigable waters, *Riparian rights, *Bulkhead line, *Dredging, High water mark, Legal aspects, Water law, Water rights, Riparian waters, Sediment control, Municipal water, Legislation, Ownership of beds, Engineering structures, Bulkheads, Walls, Permits.
Identifiers: Administrative regulations, Certification, Licenses, Fill permits, Navigation obstructions.

Where a bulkhead line has been established a riparian owner must nonetheless obtain a permit or contract prior to removing material from the bed of navigable water landward of the bulkhead line within the original ordinary high water mark. Where a bulkhead line has been established, a riparian owner may place a layer of sand or similar material landward of the bulkhead line without obraining an additional permit. Furthermore, the original ordinary high water mark will then be considered the ordinary high water mark. Particular fact circumstances may dictate, however, that the bulkhead line or the edge of the filled area should be considered the ordinary high water mark. Where a township located on Green Bay wishes to remkoe organic sediment and aquatic vegetation from the shoreline, it would be more appropriate for the town to apply for a zone of removal, than to apply for bulkhead line. (Reinders-Florida)
W76-10785

NATURAL RESOURCES, DEPT OF; NAVIGABLE WATERS.
1974 Op Att'y Gen Wisconsin 493-500. 8 p.

Descriptors: *Wisconsin, *State jurisdiction, *Navigable waters, *Artificial watercourses, *Drainage districts, Non-navigable waters, Natural streams, Governments, Legislation, Planning, Management, Water management, Dredging, Permits, Water quality control, Administration, Bodies of water, Rivers, Streams, Ownership of beds, Water policy.
Identifiers: Licenses, Public trust doctrine, Navigability tests, Administrative regulations.

The policy of the Wisconsin legislature concerning the state's waters is to promote a comprehensive program under a single state agency for the quality management and protection of all state waters, ground and surface, public and private. This responsibility extends to regulation of lands adjacent to navigable waters. Consequently, if a navigable ditch was originally a navigable stream, the state has jurisdiction since it holds the beds of navigable waters in trust for all the people. If a navigable ditch was originally nonnavigable or had no previous stream history, then the Department of Natural Resources' jurisdiction depends on the facts of each situation. Whether navigable artificial drainage ditches need be connected to navigable waters for the Department to have jurisdiction also depends upon the facts of each case. The statutory provisions apply to nonnavigable artificial waterways insofar as is necessary to protect navigable waters and owners of flooded lands. To insure compliance with state laws, a permit is necessary for the removal of material from navigable natural or artificial bodies of water. A distinction need not be made between drainage ditches located in active versus inactive drainage districts. (Reinders-Florida)
W76-10786

NAVIGABLE WATERS: RIPARIAN RIGHTS.
1974 Op Att'y Gen Wisconsin 601-05. 5 p.

Descriptors: *Wisconsin, *Navigable rivers, *Riparian rights, *Public rights, *Boating regulations, Water policy, Boating, Public access, Anchors, Regulation, Water law, Trespass, Permits, Recreation, Water Allocation(Policy), Streams, Public benefits, Legal aspects, Rivers, River beds, Streambeds, Reasonable use, Water policy.
Identifiers: *Water rights(Non-riparians), Standing(Legal), Public trust doctrine, Navigational servitude, Navigation obstructions.

Public rights in navigable streams permit reasonable use of the bottom for purposes of anchoring various types of watercraft while and only so long as a public right is being enjoyer. Anchored watercraft may not be left unattended except by a riparian owner. A riparian owner on a navigable stream normally holds title to the bed of the stream to its thread. However, that title is qualified by the rights of the public resulting from the state's governmental trust in navigable waters. The legislature has authorized limited encroachments upon the beds of such waters where the public interest will be served. Watercraft may be used on rivers of the state for floating, fishing, swimming or any of the recognized incidents of navigation without charge or fee by any landowner or municipality. Public rights do not extend to the use of privately owned uplands, or trees thereon, where such use requires entry upon these lands. Riparian owners may tie up their boats when not in use to their own docks, piers or buoys provided they do not unreasonably conflict with public use of the stream. (Reinders-Florida)
W76-10787

NORTH DAKOTA WATER QUALITY STANDARDS FOR THE SURFACE WATERS OF NORTH DAKOTA.
1972-1974 Op Att'y Gen North Dakota 253. 1 p.

Descriptors: *North Dakota, *State jurisdiction, *Water quality standards, Surface waters, *Interstate rives, Legislation, Regulation, Water pollution, Water quality control, Planning, Quality control, Water pollution control, Discharge, Water policy, Standards, Legal aspects, Political aspects, State governments.
Identifiers: Administrative regulations.

Chapter 61-28 of the North Dakota Century Code, as amended, and the North Dakota Water Quality Standards For Surface Waters of North Dakota present the rules and regulations of the North Dakota Water Pollution Control Board. Together they establish water quality standards which are enforceable for the waters into which the various projects of the state discharge. For purposes of the above, 'waters' means both interstate and intrastate waters. (Reinders-Florida)
W76-10788

SOVEREIGNTY OF STATE.
Alas Stat Ann secs 44.03.010 thru 44.03.040 (1967).

Descriptors: *Alaska, *Legislation, Jurisdiction, Boundaries(Property), *Ownership of beds, State jurisdiction, Governments, Legal aspects, State governments, Water rights, Political aspects, International law, Beds.

This chapter of the Alaska Statutes concerns the jurisdiction of the state in offshore waters and lands, and the ownership of waters and submerged lands. Jurisdiction over waters offshore from the coast extends to the outermost limits of the marginal sea as defined or recognized by the United States or by international treaty; to the high seas to the extent jurisdiction is claimed by the United States or recognized by international law; and over submerged lands. The ownership of the above waters and submerged lands is in the state unless ownership is otherwise vested by a valid and effective instrument of conveyance or by operation of law. This chapter does not limit or restrict state jurisdiction over citizens or residents, or state jurisdiction over other waters or lands inside or forming part of the boundaries of the state, nor does it alter the jurisdiction of an area to which jurisdiction extends under another provision or rule of law. (Hadoulias-Florida)
W76-10789

VILLAGE SAFE WATER ACT.
Alas Stat Ann secs 46.07.010 thru 46.07.080 (1962).

Descriptors: *Potable water, *Alaska, *Public health, *Sewage treatment, *Water purification, Water treatment, Domestic wastes, Water pollution sources, Structures, Facilities, Laundering, Social aspects, Cities, Safety, Water quality, State governments, Legislation, Administrative agencies.

The commissioner of health and social services shall develop a program providing for the installation of at least one safe water and hygenic sewage disposal facility in each village of the state. The facility shall include a source of clean water, a means of sewage disposal, shower bath facilities and facilities for washing clothes. If feasible, the building shall also contain quarters for a community health service office. The village governing body will have responsibility for maintenance and operation of the facility. An educational and informational program will be conducted in connection with the facility to explain the health advantages of using the facility to the local residents. (Capehart-Florida)
W76-10790

WATER MANAGEMENT DISTRICTS--WATER RESOURCES--AUTHORITY TO CONSIDER AND PROTECT AGAINST DEGRADATION OF WATER QUALITY THROUGH PERMITTING PROCESSES.
Op Att'y Gen. Fla. 075-16 (1975). 4 p.

Descriptors: *Florida, *Water districts, *Water pollution control, *Permits, Flood control, Water quality, Public health, Planning, Pollution abatement, Legislation, State governments, Water resources development, Water management(Applied), Control, Water control, Water policy, Water law, Regulation.
Identifiers: Certification, Administrative regulations, Water rights(Non-riparians), Dam effects, *Hazardous substances.

The Attorney General of Florida has stated his opinion that: Pursuant to Chapter 373, Florida Statutes, the Central and Southern Florida Flood Control District has general authority to protect through permitting procedures the 'water resources' within its jurisdiction. However, since the primary authority for the control of water pollution rests with the Florida Department of Pollution Control, the best way for the District to carry out its duties would be to require water quality permits or certifications from the Department of Pollution Control prior to considering any permit application under Chapter 373, or alternatively, to enter into an agreement with, or be appointed as agent of, the Florida Department of Pollution Control to carry out water quality permitting pursuant to the provisions of Chapter 403 and the rules and regulations of the Florida Department of Pollution Control. All actions of the District should comply with the Florida Water Plan. (Reinders-Florida)
W76-10791

LEGAL INTERPRETATION OF TERM 'WETLANDS'.
1973 Fla. Att'y Gen. Ann. Rep. 198-99. 2 p.

Descriptors: *Florida, *Wetlands, *Vegetation, Legislation, Water law, Regulation, Legal aspects, Geographical regions, Management, Preservation, Hydrobiology, Plant physiology, Tidal waters, Tidal marshes, Coastal marshes, High water mark, Low water mark.
Identifiers: *Coastal waters, *Coastal zone management, *Definitions(Legal).

The Assistant Attorney General of Florida has responded to a legislative request made in 1973 for a statutory definition of the term 'wetlands'. He stated that he knew of no precise legal meaning or court construction of the term when used without further clarification or definition. The term 'wetlands', in and of itself, has no precise legal interpretation, but legislatures have utilized the term in laws dealing with coastal zones by adding a statutory definition pegged to biological, physiographic, or tidal data or a combination thereof. Moreover, in many cases coastal wetlands are identified and defined separately from interior wetlands. Marine biologists have advised that linking the definition of wetlands with specific types of naturally occurring grasses or other flora can be very precise if the correct types of vegetation are listed. This appears to be the most legally precise method. An example of such a definition appears in the 1973 draft of the proposed Florida Inland and Coastal Wetlands Management and Protection Act. (Reinders-Florida)
W76-10792

VARIANCES AND TEMPORARY PERMITS FOR OPERATION OF NON-CONFORMING SEWAGE DISPOSAL FACILITIES.
1972 Florida Attorney General Annual Report 700-02. 3 p.

Descriptors: *Florida, *Sewage treatment, *Permits, *Sewage treatment, Municipal wastes, Organic wastes, Sanitary engineering, Waste disposal, Waste water disposal, Treatment, Legislation, Water pollution sources, Environmental sanitation, Water pollution, Public health, Water law, Legal aspects.
Identifiers: Administrative regulations, Variances, Temporary permits.

The Florida Department of Pollution Control is authorized to grant variances or temporary operating permits for sanitary sewage disposal facilities which have not met secondary treatment requirements by January 1, 1973, as provided in Section 403.086(2) of the Florida Statues. Furthermore, Section 403.201(1), F.S., provides that the Department of Pollution Control in its discretion may grant variances from the provisions or the rules and regulations adopted pursuant to Chapter 403. Such variances may be granted for any one of

three reasons listed in the statute. Section 403.088(4), after detailing the procedural steps in applying for a permit, requires the department to either issue or deny a temporary operating permit, but only so long as it affirmatively finds that one or more of seven listed factors exist. The department can exercise tight control over sewage treatment facilities by including in the temporary operating permits requirements and restrictions which it deems necessary and desirable to protect the quality of the receiving waters and promote the public interest. (Reinders-Florida)
W76-10793

BEACH AND SHORE RESTORATION; AUTHORITY OF STATE OVER FEDERAL AND LOCAL BEACH RESTORATION PROJECTS.
Op Att'y Gen Fla 074-118 (1974). 4 p.

Descriptors: *Florida, *Submerged Lands Act, *Federal-state water rights conflicts, *Beaches, *Governmental interrelations, Local governments, State governments, Institutional constraints, Shores, Governments, Water law, Regulation, Political aspects, Reservation doctrine, Federal government, Water rights, Legal aspects, Federal jurisdiction, State jurisdiction.
Identifiers: Coastal waters, Coastal zone management, Licenses, Sovereign immunity, Water rights(Non-riparians).

The Attorney General of Florida,has stated that: the State of Florida, through the Board of Trustees of the Internal Improvement Trust Fund and the Department of Natural Resources, has regulatory control over beach restoration projects whether carried out by the United States Army Corps of Engineers or by local governments. The State is the owner of all lands under tidal waters seaward of the mean high water line not otherwise alienated, as specifically recognized by the Submerged Lands Act of 1953. Ownership and control are in the state, subject to the paramount right of Congress to regulate for navigational purposes. Alteration or construction in these waters is controlled concurrently and requires the joint assent of the federal and state governments. Before a city or local governmental body can institute a beach renourishment project the Trustees must approve the project, and the Department of Natural Resources must exercise its permitting or setback line authority. The federal government is authorized only to assist in such projects. Furthermore, since a beach renourishment project would alter state property rights by moving the mean high water line, state concurrence is necessary before the Corps of Engineers can engage in such a project. (Reinders-Florida)
W76-10794

SARGENT LAKE ASS'N. V DANE (RIGHTS OF PROPERTY OWNERS ASSOCIATION IN A DAM, BEACH, AND SHOREFRONT AREA).
351 A2d 54-57 (NH 1976). 4 p.

Descriptors: *Beaches, *New Hampshire, *Dams, *Repairing, *Land tenure, Real property, Legal aspects, Judicial decisions, Water courses(Legal aspects), Public access, Shores, Structures, Water control, Recreation, Recreation facilities, Access routes, Land use, Natural resources, Lakes, Social aspects, Fringe benefits, Damages.

Plaintiff property owner's association sought to compel defendant successors in interest to the original developers to convey to the association all rights to a dam, a beach lot and certain lake property. The plaintiff further sought to compel the defendants to pay the cost of repairs to the dam. When the defendants acquired title to the remaining undeveloped land in the development, their deed required them to convey the dam to a property owner's association 'if and when formed'. The plaintiff contended that the defendants had a duty to maintain the dam prior to such conveyance and that the defendants were bound by an oral agreement made by the defendants' agent to convey the beach lots in question. The trial court held that the language of the deed did not require conveyance of the beach lots. Since the agent's oral agreement was in conflict with the deed, the plaintiff acquired no right to the beach lots. On this point the Supreme Court of New Hampshire affirmed. The trial court had also found, however, that the defendants were under no duty to maintain the dam. The Supreme Court reversed on this point, holding the defendants liable for maintenance for the period after formation of plaintiff association until conveyance of the dam. (Capehart-Florida)
W76-10795

COASTAL INDUSTRIAL WATER AUTHORITY V. YORK (NO CHANGE TO TITLE TO LAND BY AVULSION EVEN THROUGH AVULSION ARTIFICIALLY CAUSED).
532 SW2d 949-54 (Tex. 1976). 6 p.

Descriptors: *Texas, *Avulsion, *Boundary disputes, *Navigable rivers, Ownership of beds, Riparian rights, Boundaries(Property), Legal aspects, Eminent domain, Land subsidence, Surface-groundwater relationships, Beds under water, Regulation, Judicial decisions, Groundwater.
Identifiers: Presumptions(Legal).

In an action related to condemnation proceedings plaintiff riparian landowners sought a declaratory judgement to determine ownership of submergd property. Submersion had resulted from subsidence over a nine year period due to municipal and industrial removal of underground water. The trial court upheld the plaintiffs' ownership claims. The Texas Supreme Court affirmed, finding that the property in question had not been displaced but was covered by shallow water only. No erosion had occurred. Therefore, so long as the general public or public body had not used the area for navigation, no conflict between public and private rights existed. Addressing the title issue, the court held that submersion does not necessarily destroy title in the owner. Riparian or littoral landowners may lose or acquire title as a result of erosion or accretion but generally not through avulsion. The court then went on to hold that the riparian owners were entitled to compensation for their land which had become submerged by defendant's ship channel prior to the time that condemnation was sought. (Comer-Florida)
W76-10796

HYRUP V KLEPPE (RIGHT-OF-WAY FOR PIPELINE TO TAP WATER FROM SPRING ON PUBLIC LAND).
406 F Supp 214-17 (D Colo. 1976). 4 p.

Descriptors: *Colorado, *Right-of-way, *Appropriation, *Pipelines, *Springs, Streams, Permits, Legislation, Penalties(Legal), Land tenure, Administrative decisions, Administrative agencies, Judicial decisions, Groundwater.

Plaintiff landowner filed an application with the Department of the Interior seeking authorization to appropriate water from a nearby state owned spring. The plaintiff also filed an application with the Bureau of Land Management for a right-of-way across public land so that a pipeline could be installed to convey the appropriated spring water. The Bureau rejected the right-of-way application, however, finding that the spring waters had been reserved for the United States by executive order and was not subject to appropriation. After the Bureau's decision was affirmed by the Board of Appeals, the plaintiff appealed, contending that the spring was a tributary to a flowing stream and thus not subject to the executive order. The defendant alleged that plaintiff's application should have been rejected under any circumstnce since the application was made under the wring statute. The court found for the plaintiff, holding that the spring was a tributary to a flowing stream and that the plaintiff had applied under the proper statute. The court then remanded the case for further consideration, finding that the Bureau's discretionary authority made it inappropriate for the court to grant plaintiff's requested relief. (Hoffman-Florida)
W76-10797

ADAMS V MONTANA POWER CO. (DEFINITION OF NAVIGABLE WATERS FOR ADMIRALTY JURISDICTION).
528 F2d 437-41 (9th Cir 1975). 5 p.

Descriptors: *Drowning, *Judicial decisions, *Navigable waters, *Federal jurisdiction, *Navigation, Accidents, Legal aspects, Penalties(Legal), Dams, Boating, State jurisdiction, Discharge(Water), Ships.
Identifiers: Admiralty, Maritime vessels.

Plaintiff administratrix brought this action against defendant power company for the death of decedent who drowned after his boat was capsized as a result of a discharge from defendant's dam. The major issue was whether such a tort claim could properly be based on admiralty jurisdiction when the body of water was no longer open to commercial navigation. After the trial court dismissed the suit for lack of jurisdiction, the plaintiff appealed, contending that federal admiralty jurisdiction did attach since the body of water was a navigable waterway for purposes of the commerce clause. Although agreeing with this contention, the Ninth Circuit found that the tort had no significant relationship to traditional maritime activity. The court noted that the grant of admiralty jurisdiction was for the protection of the maritime shipping industry through the development of a uniform federal law. Since this grant of jurisdiction is an exception to the usual principle of allowing a state to apply its own law in regulating conduct within its borders, the court found that it should not be unduly extended. Thus, the decision was affirmed since no connection between the injury and commercial maritime activity had been alleged. (Hoffman-Florida)
W76-10798

EI DU PONT DE NEMOURS AND COMPANY V TRAIN (FEDERAL WATER POLLUTION PREVENTION AND CONTROL ACT QUALITY STANDARDS OF WATER AND EFFLUENT DISCHARGED INTO THAT WATER).
528 F2d 1136-42 (4th Cir 1975). 7 p.

Descriptors: *Federal Water Pollution Control Act, *Water quality control, *Effluents, *Water quality standards, *Jurisdiction, Pollution, Water pollution sources, Regulation, Waste treatment, Inorganic compounds, Legislation, Legal review, Judicial decisions.

Plaintiff chemical manufacturers sought review of regulations promulgated under the Federal Water Pollution Control Act which established effluent limitations for inorganic chemicals. After the district court dismissed the suit for lack of subject matter jurisdiction, the plaintiffs appealed. The sole question was whether the district court had jurisdiction to review the effluent limitation regulations. The Administrator of the Environmental Protection Agency contended that the regulations were issued pursuant to section 301 of the Act and thus, under section 509, were reviewable only by the court of appeals. The plaintiffs, however, contended that section 301 merely sets forth the Act's statutory objectives, and that the actual authority to implement the Act is granted by section 304. Consequently, since the review procedure set forth in section 509 does not pertain to section 304, the plaintiffs contended that the district court could properly assert jurisdiction. The Fourth Circuit rejected plaintiffs' contention, however, finding that section 509 refers to the review of the Administrator's actions taken pursuant to section 301 or section 306. Since section 306 pertains to new

sources of pollutants, while section 301 is concerned with existing sources, the court held that plaintiffs' interpretation would result in the jurisdictional question being decided by whether a new or existing source of pollutant was involved. Since such a dichotomy would have no rational basis, the court found that the district court lacked subject matter jurisdiction. (Hoffman-Florida)
W76-10799

PEOPLE EX REL YOUNGER V SUPERIOR COURT (DAMAGE ASSESSMENT TO PUBLIC ENTITY CONSTITUTIONAL BECAUSE NOT PUNITIVE).
544 P2d 1322-31 (Cal 1976). 10 p.

Descriptors: *Oil spills, *California, *Penalties(Legal), *Compensation, *Third party effects, Water quality control, Governments, Oil wastes, Oil pollution, Negligence, Legal aspects, Storage tanks.
Identifiers: Vandalism.

Due to vandalism by unknown persons, oil was discharged into state waters from private storage tanks located on the property of defendant Board of Port Commissioners. After the Regional Water Quality Board found that the Commission had failed to provide adequate security around the property, the Attorney General brought an action to impose civil penalties on both the owner of the oil and the Commission. The trial court dismissed the complaint against the Commission, however, finding that a governmental entity is immune from a punitive penalty. As to the oil owners, the court issued an order declaring that liability would arise only upon a showing of negligence. Following these orders, the plaintiff appealed to the California Supreme Court. That court found that the statutory civil penalties were not solely punitive, but were also compensatory since they provided funds to help clean-up the oil wastes. After finding that the complaint against the Board should not have been dismissed, the court reversed the negligence order, construing the statute as imposing absolute liability for oil discharge. (Hoffman-Florida)
W76-10800

SAN FRANCISCO CIVIL SERVICE ASS'N, LOCAL 400 V STATE EX REL REGIONAL WATER QUALITY CONTROL BOARD (DAMAGES ASSESSMENT FOR POLLUTANTS TO PUBLIC ENTITY CONSTITUTIONAL).
544 P2d 1331-35 (Cal. 1976). 5 p.

Descriptors: *California, *Sewage disposal, *Water pollution, *Penalties(Legal), *Municipal wastes, Waste disposal, Judicial decisions, Governments, Pollution abatement, Water pollution effects, Compensation, Constitutional law, Public rights, Public utilities.
Identifiers: Punitive damages, Governmental immunity.

The City of San Francisco was to be assessed civil penalties for the dumping of raw sewage into state waters in violation of a state statute. The city subsequently brought this action seeking a writ of mandate that the penalties to be assessed were of a punitive nature and thus could not be assessed against the city. The city relied on section 18 of the Government Code which states that public entities are immune from liability for punitive damages. After the trial court denied the writ, the decision was appealed. The Supreme Court of California affirmed, finding that the civil penalties imposed, while punitive in nature, were aimed at compensating the people of the state for the unquantifiable harm caused by the unauthorized dumping of raw sewage. Consequently, the city was not entitled to a writ of mandate. (Hoffman-Florida)
W76-10801

BUSHY AND VANGUARD V, LTD V SEVEN LAKES RESERVOIR CO. (SEEPAGE AND PERCOLATION FROM SUBSURFACE DESTROYING ADVERSE POSSESSOR'S CLAIMS).
545 P2d 158-162 (Colo. Ct. App. 1976). 5 p.

Descriptors: *Colorado, *Adverse possession, *Reservoirs, *Water storage, *Basins, Subsurface waters, Land tenure, Judicial decisions, Surfaces, Farms, Legal aspects, Real property, Boundary disputes, Percolation.
Identifiers: Surface estate, Subsurface estate.

Plaintiff landowners brought this action to quiet title to land bordering two reservoirs owned by defendant corporation. While the defendats held a deed to the disputed area, the plaintiffs had fenced and used the area for farmland for eighteen years and were claiming title by adverse possession. The defendant, however, contended that the plaintiffs' use of the land was merely permissive and that the corporation's employees oftern crossed the fence to spray weeds and remove trash. The defendant also noted that it used the subsurface of the disputed area for underground storage of water; consequently, the plaintiffs had failed to show the adverse possession necessary. The Colorado Court of Appeals disagreed, holding that the surface estate can be severed from the subsurface estate for purposes of adverse possession. In this case, the court found that the actions of defendant's employees in spraying weeds and removing trash were not sufficient to prevent the adverse claimant from obtaining title. Nevertheless, the defendants use of the subsurface as a storage basin was sufficient to prevent the establishment of plantiffs' adverse claim to the subsurface area. (Hoffman-Florida)
W76-10802

PROVO CITY V LAMBERT (MODIFICATION OF CITY'S APPROPRIATION CERTIFICATE).
545 P2d 185-187 (Utah 1976). 3 p.

Descriptors: *Water permits, *Utah, *Water allocation(Policy), *Appropriation, *Water supply, Water contracts, Water demand, Water law, Water resources, Water requirements, Water rights, Water users, Administrative decisions, Municipal water.

Plaintiff city brought an action seeking to modify a certificate of water appropriation issued by defendant state engineer in 1949. The certificate, which limited the amount of water the city could obtain, had recently been enforced by the state engineer. During the twenty years prior to this enforcement the city had received more water than the amount specified by the certificate. Consequently, the city contended that the state engineer was estopped from enforcing the certificate's water limitations. The city also contended that the certificate's limitation was based upon mutual mistake at the time of issue. The defendant contended, however, that the certificate was valid when issued and that the city could not attempt to modify it since the time for appeal had long since passed. The defendant also contended that the excessive water supply made available to the city did not constitute a waiver of the provisions of the certificate. After the trial court had refused to grant defendant's motion to dismiss the complaint, the defendant appealed. The Supreme Court of Utah reversed, holding that the city was estopped from attempting to modify the certificate since the authorized time for appeal had long since expired. (Hoffman-Florida)
W76-10803

PHILLIPS RANCH, INC. V BANTA (RIGHTS IN WATER ADJACENT TO PLAINTIFF'S PROPERTY DOESN'T GIVE DEFENDANT EASEMENT TO CARRY WATER OVER PLAINTIFF'S PROPERTY).
543 P2d 1035-41 (Ore. 1975). 7 p, 1 map.

Descriptors: *Oregon, *Obstruction of flow, *Negligence, *Overflow, *Adjacent landowners, Judicial decisions, Topsoil, Penalties(Legal), Legal aspects, Rivers, River flow.
Identifiers: Nuisance.

Plaintiff property owner brought this action for injunctive relief and damages against defendant adjacent land owner. The plaintiff alledged that the defendant's actions in placing obstructions in a river running through both of their properties constituted a nuisance. The plaintiff also alleged that he incurred serious financial injury when his topsoil was washed away by an overflow caused by the obstructions. After the trial court awarded damages and denied injunctive relief, the defendant appealed, contending that the trial court's refusal to grant the injunction indicated that the court premised liability on a negligence theory, and not on the existence of a nuisance. Consequently, the defendant contended that it was entitled to a new trial since a finding based on negligence would involve issues of reasonable care and comparative negligence not addressed at the trial court. The Supreme Court of Oregon rejected these contentions, however, noting that the defendant's basic assumption that a nuisance is a continuing condition was not well founded. Because the defendant had subsequently removed the obstructions, the Supreme Court found that the trial court was correct in denying injunctive relief. The Court also affirmed the award of damages, finding that there was ample evidence to support the award. (Hoffman-Florida)
W76-10804

TEXT AND COMMENTARY FOR WEATHER MODIFICATION CONTROL LAW,
Arizona Univ., Tucson. Coll. of Law.
For primary bibliographic entry see Field 3B.
W76-10809

AN INVESTIGATION OF EFFLUENT CONTROL STANDARDS AND PRACTICES (ATOMIC ENERGY PRODUCTION),
Douglas United Nuclear, Inc., Richland, Washington.
For primary bibliographic entry see Field 5G.
W76-10828

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10829

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
For primary bibliographic entry see Field 3B.
W76-10912

PROSPECT FOR SEA-BED RESOURCES IN A RECESSION,
U. Wassermann.
Journal of World Trade Law, Vol. 9, No. 6, p. 711-713, 1975. 3 ref.

Descriptors: *Oceans, *Mining, *Economic impact, *Market value, Export, Equitable apportionment, Manganese, Nickel, Copper, Cobalt, Molybdenum, Metals, Income distribution, Law of the Sea, Compensation.
Identifiers: *World markets, *Recession, Developing countries, Sea bed mining.

The UNCTAD Secretariat is studying sea-bed mineral resources. Those most likely to be com-

mercially exploitable soon are manganese nodules containing nickel, copper, cobalt, and manganese plus traces of metals such as molybdenum. A North Pacific area has large quantities of these nodules which are collecting faster than the component metals are being consumed. National and international groups have explored the area and are evaluating it as a potential mining site. Distribution of economic benefits would be uneven if guided by present commercial criteria. Production costs might be lower and adversely affect land-based operations, especially in developing countries. Large-scale capital investments used in exploration and mining of these sea-bed resources would reduce investments in developing countries and lower their export earnings. A compensatory or preventive approach appears to be the solution, but income of a proposed sea-bed authority would be inadequate to provide compensating funds to developing countries for losses. These proposals assume that developing countries not producing these resources want to keep prices high. Resistance of consumers in developing countries to high prices, especially during a recession, is probably underestimated. The effects of the current recession on the consumption of these metals and on world prices has not been considered. (Buchanan-Davidson--Wisconsin)
W76-10979

PROBLEMS OF PUBLIC WORKS PROJECTS IN THE PRESENT ECONOMIC CLIMATE,
San Bernardino Valley Municipal Water District, Calif.
For primary bibliographic entry see Field 6C.
W76-10980

COMPREHENSIVE WATER SUPPLY STUDY FOR NEW YORK STATE,
New York State Dept. of Health, Albany. Bureau of Public Water Supply.
For primary bibliographic entry see Field 6B.
W76-10982

'WARE THE WADDEN SEA,
Foundation for Applied Ecology, Edam (Netherlands).
For primary bibliographic entry see Field 6G.
W76-10985

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11001

ANIMAL WASTE MANAGEMENT--COMMENTS ON THE NATIONAL SITUATION,
Agricultural Research Service, Peoria, Ill. Agricultural and Natural Resources Div.
For primary bibliographic entry see Field 5D.
W76-11033

LEGAL ASPECTS OF LIVESTOCK PRODUCTION AND WASTE MANAGEMENT,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W76-11044

EPA'S ROLE IN THE ANIMAL WASTE PROBLEM: PANEL DISCUSSION,
Agricultural Stabilization and Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11045

SOIL CONSERVATION SERVICE PROGRAM IN ANIMAL WASTE MANAGEMENT,
Soil Conservation Service, Des Moines, Iowa.
For primary bibliographic entry see Field 5G.
W76-11046

LEGAL ASPECTS OF ODOR AND DUST FROM FEEDLOTS,
Texas Agricultural Extension Service, College Station.
For primary bibliographic entry see Field 5G.
W76-11054

A SUMMARY OF STATE REGULATIONS PERTAINING TO ANIMAL WASTE MANAGEMENT IN THE NORTH CENTRAL REGION OF THE UNITED STATES,
Michigan State Univ., East Lansing. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-11060

SAFE DRINKING WATER ACT - IMPLICATIONS FOR GROUND WATER QUALITY PROTECTION,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5F.
W76-11064

SHARING THE OFFSHORE OIL BONANZA.
For primary bibliographic entry see Field 6C.
W76-11088

A PUBLIC AUTHORITY TO MANAGE THE ATLANTIC OUTER CONTINENTAL SHELF,
Delaware Univ., Newark. Coll. of Marine Studies. W. S. Gaither.
Coastal Zone Management Journal, Vol 2, No 1, p 59-64, 1975. 5 ref.

Descriptors: *Continental Shelf, Resources development, *Management, Water resources, Economics, Conservation, *Environmental effects, Commerce, Export, Import, Law of the Sea, Northeast U.S., Southeast U.S., Atlantic Ocean.
Identifiers: *Outer Continental Shelf, 200 mile limit.

The United States is increasingly in need of the Atlantic Continental Shelf for a variety of uses including the recovery of nonliving and living resources. It is proposed that an Atlantic Outer Continental Shelf Authority be established to insure the efficient and economical conservation and development of the Atlantic Outer Continental Shelf. The Authority must consider the special interests of the United States, the bordering states, other nations, and other individuals and organizations who wish to use the Continental Shelf or its resources. Other major issues the Authority must face include finances, maritime commerce, import and export of resources, and marine conservation. (Sinha-OEIS)
W76-11097

6F. Nonstructural Alternatives

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
For primary bibliographic entry see Field 10C.
W76-10502

INTERBOARD PLAN FOR THE GREATER FINGER LAKES - OSWEGO RIVER BASIN,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 4A.
W76-10506

IDENTIFICATION OF SPECIAL HAZARD AREAS LIST OF COMMUNITIES WITH SPECIAL HAZARD AREAS,
Federal Insurance Administration, Washington, D. C.
F. V. Reilly.
Federal Register, Vol. 40, No. 144, p. 31220-22, July 25, 1975. 2 p, 1 tab.

Descriptors: *Flood plains, *Flood plain zoning, *Flood plain insurance, *Institutional constraints, Law enforcement, Floods, Regulation, Compensation, Protection, Damages, Legal aspects, Insurance, Administration, Legislation, Federal government, United States, Water law.
Identifiers: *Flood Disaster Protection Act, Administrative regulations.

The Flood Disaster Protection Act of 1973 requires communities to purchase flood insurance on or after March 2, 1974 if they are to be eligible to receive any federal funds for acquisition or construction purposes in an identified flood plain area. Effective July 1, 1975 or one year after identification of the community as flood prone, whichever is later, no financial assistance can be provided if the identified community has not entered the program. Therefore, the identification of special hazard areas makes mandatory the purchase of insurance. The community, however, shall be given six months to establish that it is not seriously flood prone or that the alleged flood hazards have been corrected. The regulation amends section 1915.3 of title 24 of the Code of Federal Regulations as authorized by the National Flood Insurance Program. It adds to the list of identified communities having areas of special flood, mudslide, or erosion hazards. (Griffith-Florida)
W76-10773

ZONING--FLOOD CONTROL.
For primary bibliographic entry see Field 6E.
W76-10781

6G. Ecologic Impact Of Water Development

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
For primary bibliographic entry see Field 10C.
W76-10502

ENVIRONMENTAL INVESTIGATION OF EDEN ISLES,
Burk and Associates, Inc. (New Orleans).
For primary bibliographic entry see Field 5G.
W76-10510

WATER QUALITY ANALYSIS, IOWA-CEDAR RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W76-10576

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, CONNECTICUT RIVER.
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 5G.
W76-10577

WATER QUALITY ANALYSIS, SANTEE RIVER BASIN,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.

W76-10578

WATER QUALITY ANALYSIS, COLUMBIA RIVER.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-10579

MARINE TECHNOLOGY SOCIETY EIGHTH ANNUAL CONFERENCE PREPRINTS,
Marine Technology Society, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10600

THE ENVIRONMENTAL IMPACT OF DEEP-SEA MINING,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 5G.
W76-10602

MULTIOBJECTIVE PLANNING AND ENVIRONMENTAL EVALUATION OF WATER RESOURCE SYSTEMS,
State Univ. of New York at Binghamton. Dept. of Geological Sciences; and State Univ. of New York at Binghamton. School of Advanced Technology.
M. Morisawa, and R. Vemuri.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-255 665, $6.75 in paper copy, $3.00 in microfiche. Completion Report, (1976). 153 p, 72 fig, 12 tab, 19 ref. OWRT C-6065(5208) (1).

Descriptors: Environmental effects, Decision making, Flooding, Runoff, *New York, Planning, Urbanization, Erosion, Sedimentation, Attitudes, Model studies, Optimization, Measurement.
Identifiers: Binghamton(NY), Matrix, Inventory units, Pair-wise preferences, Susquehanna River basin, *Multi-objective planning, *Channelization, Psychophysics.

Urbanization in the binghamton area of the Susquehanna River basin caused increased runoff and flooding. Attempts to 'improve' local tributaries by channelization ignored basic principles of stream equilibrium and were unsuccessful. Adjustment by the streams to man induced environmental changes in the watershed resulted in erosion and sedimentation. Man's impact on rivers can be lessened by actions which are in harmony with fluvial dynamics. Using principles of equilibrium concepts, inventories of watersheds can be made and used in water resources and river planning. An impact matrix based on characteristics and equilibrium of a river can direct the choice of watershed plans. The rows and columns of the impact matrix describe plans and attributes and the entries are the values attained by the attributes in individual plans. Selection of one plan, then, boils down to a multiatribute optimization problem. One of the difficulties in this problem is the task of measurement. Psychophysical measurement techniques are often required as several of the attributes characterizing environmental impact do not lend themselves for measurement. As psychophysics deals with theproblem of subjective discrimination using sensation differences, the above problem was formulated in terms of pair-wise, subjective preference judgments of individual judges as input and an index of quality associated with each plan as output. The resulting problem was solved using a bounded-bariable LP code. This model, which is essentially a paramorphic representation of a single judge's decision making process can be extended to the case of multiple judges.
W76-10610

ASSESSMENT OF POLYVINYL CHLORIDE AS A PACKAGING MATERIAL FOR DISTILLED SPIRITS, (ENIVRONMENTAL IMPACT ASSESSMENT),
Bureau of Alcohol, Tobacco and Firearms, Washington, D. C.
R. C. Bailie, B. T. Riley, and R. Zaltzman.
Available from the National Technical Information Service, Springfield, VA 22161, as EIS-AA-73-0477-F-2., $9.25 in paper copy, $3.00 in microfiche. January 17, 1973. 257 p, 12 fig, 45 tab, 7 append.

Descriptors: *Environmental control, *Environmental effects, *Materials testing, *Research and development(Comprehensive planning), *Waste disposal, Landfills, Municipal wastes, Solid wastes, Economics, Ecology, Analytical techniques, Planning, Technology, Resource development, Administrative agencies.

The study's objective was to provide criteria for the Bureau of Alcohol Tax and Firearms to approve or disapprove the packaging of distilled spirits in glass or polyvinyl chloride (PVC) containers. Environmental evaluations were of foremost concern, yet economic and social factors were assessed. The analysis of container use was primarily confined to an evaluation of impacts upon the environment. The use of PVC's is far superior to glass in its potential for environmental damage. Figures and tables depicted that glass is four (4) times more desirable on a per pound basis. On the other hand only one-eighth as much PVC is needed per package. The greatest environmental impact was energy expended by consumers in obtaining liquor at the retail level. This factor remained the same for either substance. Glass was superior to PvC in its disposal aspects. This, however, represents less than ten percent of the total environmental insult. Likewise, both containers had little impact on solid waste disposal. No reason existed for denying the use of PVC as a packaging material for distilled spirits. Funds derived from taxes on liquor should be channeled into sponsored research to further or subsidize existing recycling programs. (Proctor-Florida)
W76-10722

ENERGY CRISIS, SUPERTANKERS AND ECOLOGY,
For primary bibliographic entry see Field 5G.
W76-10735

ROOKERY BAY: ECOLOGICAL CONSTRAINTS ON COASTAL DEVELOPMENT,
Conservation Foundation, Washington, D. C.
J. Clark.
Florida Environmental and Urban Issues, Vol 11, No 4, p 9-13 (1975). 5 p, 1 photo.

Descriptors: *Florida, *Ecosystems, *Mangrove swamps, *Wetlands, *Estuarine environment, Ecology, Projects, Southeast U. S., Gulf Coastal Plain, Biota, Vegetation establishment, Biological communities, Dominant organisms, Preservation, Protection, Water resources, Water resources development, Scenery, Recreational facilities, Conservation, Land management, Land development, Administration, Planning, Project planning, Population, Human population.
Identifiers: *Rookery Bay(Fla), Collier County(Fla), South Florida.

The Conservation Foundation began a study of Collier County, Florida, in 1967 for purposes of environmental protection and economic welfare. The Rookery Bay area, was chosen for an in-depth study because it represented an ecosystem characteristic of the mangrove-estuarine environment of South Florida. The study suggests that all wetland areas be preserved intact through an integrated program restricting water development by redirecting it to dry-land sites. Purchases of water-area parcels for public recreational and scenic purposes are also suggested. Other recommendations include primary and contingency standards allowing for a variety of environmentally compatible uses of privately owned water areas in a uniform program of water area management. Anticipated objections center around fears that the expected population growth cannot be accomodated if development is limited to dry land areas. However, if the county encourages spot density concentration, this problem can be overcome. (Hadoulias-Florida)
W76-10741

LAWYERS AND ECOMANAGEMENT,
Puerto Rico Univ., Mayaguez. Inst. for Policy Studies and Law.
For primary bibliographic entry see Field 6E.
W76-10753

NEW SOURCE NPDES PERMITS PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS,
Environmental Protection Agency, Washington, D. C.
J. Quarles.
Federal Register, Vol 40, No 197, p 47714-20, October 9, 1975. 7 p, 2 append.

Descriptors: *Permits, *Federal Water Pollution Control Act, *Water pollution sources, *Decision making, *Federal project policy, *Environmental control, Discharge(Water), Management, Project planning, Environment, Pollution control, Environmental effects, Water pollution, Governmeatal interrelations, Water quality, Pollution abatement, Water law, Water policy, Legislation, Administration, Regulation.
Identifiers: *Licenses, *FWPCA Amendments of 1972, *Environmental impact statement, *National Pollutant Discharge Elimination System, Environmental Protection Agency(EPA), National Environmental Policy Act of 1969, Administrative regulations.

Procedures are established for applying the National Environmental Policy Act of 1969 (NEPA) to the issuance of new source National Pollutant Discharge Elimination System (NPDES) permits as authorized by the Federal Water Pollution Control Act as amended(FWPCA). NEPA requires that all agencies of the Federal Government prepare detailed environmental statements on proposals for legislation and other major actions significantly affecting the quality of the human environment. FWPCA requires that NEPA apply to the issuance of a permit for the discharge of any pollutant by a new source. This regulation shall apply only to the issuance of a new source NPDES permit by the Environmental Protection Agency and not to the issuance of such a permit from any state which has an approved NPDES program. The regulation, when used in conjunction with the National Pollutant Discharge Elimination System will provide the EPA procedures for processing new source NPDES permit applications. (Reinders-Florida)
W76-10757

DEEPWATER PORT SITE EVALUATION,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10766

DEEPWATER PORTS: LICENSING PROCEDURES AND DESIGN CONSTRUCTION, EQUIPMENT AND OPERATIONS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-10767

TEXT AND COMMENTARY FOR WEATHER MODIFICATION CONTROL LAW,
Arizona Univ., Tucson. Coll. of Law.
For primary bibliographic entry see Field 3B.
W76-10809

STUDIES FOR WILDLIFE ON ENERGY AREAS,
Utah State Div. of Wildlife Resources, Salt Lake City.
R. W. Baumann, R. N. Winget, W. H. Behle, W. F. Sigler, and G. W. Workman.
Bureau of Land Management report, Dec. 1975, 276 p.

Descriptors: *Wildlife, *Energy, Wildlife habitats, *Utah, Aquatic invertebrates, *Fish, *Water quality, *Birds, Ecology, Foods, Nesting, Population, Trapping, Tagging, Aquatic habitats, Nongame birds, Distribution, Food chains, Animal populations, Growth rates, Spring waters, Predation.
Identifiers: White River(Utah), Uinta County(Utah), Uinta Basin, Bonanza(Utah), Ouray(Utah), *Oil Shale Area, *Geothermal area, Juab and Millard County, Least Chub, Snake Valley, Tule Valley, Hawks, Raptors, Eagles, Falcons, Owls, Endangered species, Birds of prey.

This is a four part report concerning studies of wildlife on energy areas. Three reports are on the oil shale area of northeastern Utah and are entitled 'Aquatic Macroinvertebrate, Water Quality, and Fish Population Characterization of the White River, Uintah County, Utah', Raptor Study of Utah Oil Shale Area', and 'Nongame Mammal Inventory of the Utah Oil Shale Area'. The fourth is a study of the Least Chub in west central Utah entitled 'Studies on the Least Chub (Iotichthys Phlegethontis - Cope) in Geothermal Activities Area of Snake and Tule Valleys, Utah'. (See W76-10821 thru W76-10824) (BLM)
W76-10820

AQUATIC MACROINVERTEBRATE WATER QUALITY, AND FISH POPULATION CHARACTERIZATION OF THE WHITE RIVER, UINTAH COUNTY, UTAH,
Brigham Young University, Provo, Utah.
R. W. Baumann, and R. N. Winget.
Project conducted for Utah Division of Wildlife Resources, Salt Lake City, Dec. 1975. 55 p, 16 fig, 10 tab, 4 ref. 52500-CT4-450-BLM.

Descriptors: *Invertebrates, *Fish, *Water quality, *Fisheries, *Aquatic invertebrates, Aquatic habitats, *Utah, Fish populations.
Identifiers: *White River(Utah), Uintah County(Utah), Bonanza(Utah), Ouray(Utah), *Oil Shale Area(Utah).

To provide environmental evaluation of proposed oil shale developments along the White River in Uintah County, Utah, macroinvertebrate, fish, and water quality samples were taken. Macroinvertebrate populations are analyzed both qualitatively and quantitatively. A list of fishes collected is given and habitat evaluation summarized. Physical and chemical data collected on August 11 and 12 are provided and analyzed according to water quality requirements. Basic recommendations are given concerning the ecological stability of the White River with reference to possible water uses. (See also W76-10820) (BLM)
W76-10821

RAPTOR STUDY OF UTAH OIL SHALE AREA,
Utah University, Salt Lake City.
W. H. Behle, and M. L. Perry.
Project conducted for; Utah Division of Wildlife Resources, Salt Lake City, 1975. 149p, 26 fig, 6 tab, 19 ref. 52500-CT4-450-BLM.

Descriptors: Birds, *Ecology, Nesting, Population, Animal populations, *Utah, Food chains, Predation.
Identifiers: *Oil shale area(Utah), White River(Utah), Uintah County(Utah), *Raptors, Hawks, Eagles, Falcons, Owls, *Birds of prey.

A study of the raptors in the Utah oil shale area in northeastern Utah was made during the spring and summer of 1974 and 1975. Sixteen kinds of diurnal birds of prey were found. The most common species were, in the order of abundance, (1) the American Kestrel (Sparrow Hawk), (2) Red-tailed Hawk, (3) Golden Eagle, (4) Turkey Vulture, (5) Cooper's Hawk. Less common were the (6) Prairie Falcon, (7) Marsh Hawk, (8) Sharp-shinned Hawk, (9) Swainson's Hawk, (10) Ferruginous Hawk. All these are breeding species. The Osprey occurred in migration and the Goshawk, Rough-legged Hawk, Bald Eagle and Merlin in winter. One endangered species, the Peregrine, still occurs in the general area as an occasional migrant and rare breeder. The Peregrine is the only species for which there is evidence of a decline in numbers. Eleven kinds of nocturnal birds of prey occur in the area. Only the Great Horned Owl is common. Other kinds are the Screech Owl, Pygmy Owl, Burrowing Owl, Long-eared Owl, Short-eared Owl, all in the oil shale area, and in the general peripheral area, the Barn Owl, Flammulated Owl, Snowy Owl, Spotted Owl and Saw-whet Owl. For each species, seasonal status, relative abundance, records of occurrence and ecological data are given. (See also W76-10820) (BLM)
W76-10822

NONGAME MAMMAL INVENTORY OF THE UTAH OIL SHALE AREA,
Natural History State Museum, Vernal, Utah.
M. L. Perry.
Project conducted for: Utah Division of Wildlife Resources, Salt Lake City, 1975. 50p, 1 fig, 6 tab, 9 ref. 52500-CT4-450-BLM.

Descriptors: *Nongame animals, Mammals, Vegetation, Predation, *Utah, Small game, Trapping, *Surveys.
Identifiers: *Oil shale area(Utah), Uintah County(Utah), Uinta Basin(Utah), White River(Utah), Evacuation Creek(Utah), Snap traps.

During the spring and summer of 1974 and 1975 a field inventory of nongame mammals was conducted on Utah's oil shale lands in northeastern Utah. The area, located south of Bonanza, Utah, is characterized as a dry, semi-arid plateau sloping gently to the north where it meets the Uinta Basin. Mammal studies conducted by previous researchers revealed a diversity of sixty-three different kinds. In 1973 Olsen collected and studied small nongame mammals of the oil shale area and identified abundance and densities. The present study is a continuation of Olsen's small mammal investigation and thus serves as a 'monitor' to his study. Six vegetative types were sampled during the survey: 1) Cottonwood, willow, and tamarix 2) desert shrub 3) salt desert 4) greasewood 5) sagebrush and 6) pinyon-juniper. The ecological preference, relative abundance, and density were determined for each of the species. Specimens were collected with snap traps set at 30 foot intervals for two to three consecutive nights at each site. Twenty-five localities were sampled in the study area. Eighteen kinds of small mammals were found to occur in the area. The most common species were in order of their abundance, Deer Mouse (Peromyscus maniculatus), Colorado Chipmunk (Eutamias quadrivittatus), Apache Pocket Mouse (Perognathus apache), Ord's Kangaroo Rat (Dipodomys ordii) Desert Woodrat (Neotoma lepida), and the Pinyon Mouse (Peromyscus trueii). (See also W76-10820) (BLM)
W76-10823

STUDIES ON THE LEAST CHUB (IOTICHTHYS PHLEGETHONTISCOPE) IN GEOTHERMAL ACTIVITIES AREA OF SNAKE AND TULE VALLEYS, UTAH,
Utah State Univ., Logan.
W. F. Sigler, and G. W. Workman.
Project conducted for Utah Division of Wildlife Resources, Salt Lake City, 1975. 22 p, 5 fig, 6 tab, 8 ref. 5250-CT4-450-BLM.

Descriptors: *Fish, Growth rates, Management, *Utah, Distribution, *Geothermal studies, Fish populations, Fish types, Water pollution.
Identifiers: *Least chub, Endangered species, Snake River Valley(Utah), Tule River Valley(Utah).

Least chub, an endangered fish species is apparently limited to one water source (LeLand Harris Springs area) in Juab and Millard counties. Information relative to habitat requirements, potential habitat, predators and pollution was studied. Recommendations for future management of this species is also presented. (See also W76-10820) (BLM)
W76-10824

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10825

FISH AND WILDLIFE IMPLICATIONS OF UPPER MISSOURI BASIN WATER ALLOCATION, A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10826

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI. APPENDIX E, F, G, (ENVIRONMENTAL IMPACT STATEMENT.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W76-10827

THE LEGAL REQUIREMENT FOR THE ASSESSMENT OF INADVERTENT WEATHER MODIFICATION - AN ENGINEERING VIEWPOINT,
Dames and Moore, Atlanta, Ga.
For primary bibliographic entry see Field 3B.
W76-10912

URBAN AEROSOLS AND INADVERTENT WEATHER MODIFICATION,
Rockwell International, Thousand Oaks, Calif. Science Center.
For primary bibliographic entry see Field 4C.
W76-10913

OIL PORTS ON THE CONTINENTAL SHELF,
Exxon Research and Engineering Co., Florham Park, N. J.
For primary bibliographic entry see Field 5G.
W76-10984

'WARE THE WADDEN SEA,
Foundation for Applied Ecology, Edam (Netherlands).
W. Dieren.
New Scientist, Vol. 69, No. 981, p. 16-18, 1976.

Descriptors: *Management, *Estuaries, *Europe, *Protection, Tourism, Environmental effects, Water pollution effects, Fish conservation, Wildlife conservation, Recreation, Industries, Land reclamation, Powerplants, Oil industry, Dikes, Pesticides, International commissions.
Identifiers: *Waddensea(The Netherlands), West Germany, Denmark, North Sea, River Rhine.

The Waddensea, an estuary north of The Netherlands, west of Germany, and west of Denmark is an important habitat for wildlife and is the main nursery grounds for North Sea fish. Its environment is threatened by recreation, tourism, indus-

trialization, land reclamation, oil drilling, power plant installations, uncontrolled land use, and pollutants. A tripartite scientific working party recently met to draw up detailed recommendations on which the concerned governments are being asked to act. The mobilization of public opinion and the pressures of the European Community and World Wildlife Fund have resulted in the formation of the Waddensea Working Party as a private initiative. It has prepared a list of proposals, including that the three governments should manage the region as an entity and in accordance with international conventions on pollutants. Evaluation of the need for and siting of industrial plants is requested; industrial sprawl and development must be limited; recreation pressure should be limited to the local carrying capacity; flying and hunting should be restricted; oil and gas drillings should be restricted as to quantity and pollution; and that no major alterations, either industrial or recreational, should be allowed without scientific advice. The involvement of a group of scientists, public opinion, and an unofficial convention is setting a trend in environmental conservation. (Auen-Wisconsin)
W76-10985

OUTER CONTINENTAL SHELF RESOURCE DEVELOPMENT SAFETY: A REVIEW OF TECHNOLOGY AND REGULATION FOR THE SYSTEMATIC MINIMIZATION OF ENVIRONMENTAL INTRUSION FROM PETROLEUM PRODUCTS.
Assembly of Engineering Marine Board, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-11001

TECHNICAL CAPABILITIES OF OFFSHORE EXPLORATION OPERATIONS TO MAXIMIZE SAFETY AMD ENVIRONMENTAL PROTECTION,
Humble Oil and Refining Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-11004

OFFSHORE OIL: TECHNOLOGY - AND EMOTION,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5G.
W76-11090

A THOROUGH LOOK AT CURRENT OFFSHORE PETROLEUM OPERATIONS.
For primary bibliographic entry see Field 6C.
W76-11091

OIL SPILLS AND OFFSHORE PETROLEUM,
Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 5G.
W76-11092

OFFSHORE OIL SPILLS AND THE MARINE ENVIRONMENT,
Massachusetts Inst. of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-11093

FINAL ENVIRONMENTAL STATEMENT, CONSTRUCTION OF ARTIFICIAL REEFS IN THE ATLANTIC OCEAN OFF CAPE HENRY, VIRGINIA.
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 8B.
W76-11094

A PUBLIC AUTHORITY TO MANAGE THE ATLANTIC OUTER CONTINENTAL SHELF,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 6E.
W76-11097

7. RESOURCES DATA

7A. Network Design

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W76-10588

DESIGN OF NATIONWIDE WATER-QUALITY MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-10643

SOME INTERNATIONAL ACTIVITIES IN ENVIRONMENTAL MONITORING,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 5A.
W76-10644

EARTHWATCH-SENTINEL FOR THE FUTURE,
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-10645

NETWORK DESIGN CONSIDERATIONS FOR THE GLOBAL ENVIRONMENTAL MONITORING SYSTEM (GEMS) OF THE UNITED NATIONS,
Smithsonian Astrophysical Observatory, Cambridge, Mass.
For primary bibliographic entry see Field 5A.
W76-10646

A PROPOSED NATIONAL MONITORING SYSTEM FOR ORGANICS IN WATER,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W76-10668

7B. Data Acquisition

DIPLOMATIC AND LEGAL ASPECTS OF REMOTE SENSING,
Department of State, Washington, D. C.
For primary bibliographic entry see Field 6E.
W76-10584

AN EVALUATION OF AUTOMATIC WASTEWATER COMPOSITORS,
Environmental Protection Agency, Kansas City, Kans. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W76-10652

REMOTE SENSING OF GROUND AND SURFACE WATER CONTAMINATION BY LEACHATE FROM LANDFILL,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W76-10666

ASSESSMENT OF THE BENEFITS OF ENVIRONMENTAL REMOTE SENSING,
Enviro Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-10670

EVALUATION OF WATER SAMPLES COLLECTED DURING LANDSAT-1 OVERPASSES OF THE LOWER CHESAPEAKE BAY AREA,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 5A.
W76-10672

SOME OBSERVATIONS ON THE JOSS-WALDVOGEL RAINFALL DISDROMETER,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 2B.
W76-10928

APPLICATION OF A RESIDENCE TIME MODEL TO DILUTION GAUGING, WITH PARTICULAR REFERENCE TO THE PROBLEM OF CHANGING DISCHARGE,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W76-10935

AUTOMATED DETERMINATION OF CARBON IN NATURAL WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W76-10936

NEAR SURFACE SAMPLER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-10995

TECHNIQUES FOR ESTIMATING FLOOD DEPTHS FOR OKLAHOMA STREAMS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 4A.
W76-11075

U.S. GEOLOGICAL SURVEY WATER QUALITY MONITOR, OPERATIONS MANUAL,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5A.
W76-11080

7C. Evaluation, Processing and Publication

IMPLEMENTATION OF A LARGE SCALE WATER QUALITY DATA MANAGEMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 5A.
W76-10588

MANAGEMENT OF GROUNDWATER QUALITY DATA,
Commonwealth Associates, Inc., Jackson, Mich.
For primary bibliographic entry see Field 5A.
W76-10660

AUTOMATED FORECAST PROCEDURES FOR RIVER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 5A.
W76-10664

A PROPOSED NATIONAL MONITORING SYSTEM FOR ORGANICS IN WATER,
Environmental Research Lab., Athens, Ga.

For primary bibliographic entry see Field 5A.
W76-10668

GROUNDWATER AVAILABILITY IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10718

PUBLIC GROUNDWATER SUPPLIES IN MCHENRY COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-10719

METEOROLOGICAL ASPECTS OF THE OAHU FLOOD OF 19 APRIL 1974,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W76-10807

A SIMULATION MODEL OF TRITIUM KINETICS IN A FRESHWATER MARSH,
Ohio Cooperative Wildlife Research Univ, Columbus.
For primary bibliographic entry see Field 5B.
W76-10812

SIMULATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS: FINAL REPORT,
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-10813

WATER RESOURCES DATA FOR WISCONSIN. PART 1. SURFACE WATER RECORDS. PART 2. WATER QUALITY RECORDS.
Geological Survey, Madison, Wis. Water Resources Div.
Data Report, 1975, 347 p. 5 fig, 27 ref, Numerous tab.

Descriptors: *Water quality, *Wisconsin, *Water resources, *Hydrologica data, Streamflow, Reservoir storage, Water chemistry, Water properties, Biological properties, Physical properties, Surface waters, Data collections, Gaging stations, Sampling, On-site data collections, Great Lakes region.

Water resources data for the 1974 water year for Wisconsin are given, including records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites, and records of water quality on the chemical, biological, and physical characteristics of surface water. A glossary of terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined. An index of recording stations is included. (Witt-IPC)
W76-10832

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

APPLICATION OF THE STANFORD WATERSHED MODEL TO NIGERIAN WATERSHEDS,
Nigeria Univ., Nsukka. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-10923

A COMPARISON OF SEVERAL WATER QUALITY INDEXES,
CACI, Inc., Reston, Va. Information Technology Dept.
For primary bibliographic entry see Field 5A.
W76-10926

THE SPARTA AQUIFER SYSTEM IN MISSISSIPPI,
Geological Survey, Jackson, Miss.
R. Newcome, Jr.
Water-Resources Investigations 76-7 (open-file report), March 1976. 3 sheets, 15 fig, 3 tab, 16 ref.

Descriptors: *Groundwater resources, *Water quality, *Aquifer characteristics, *Water supply, *Mississippi, Water wells, Water utilization, Hydrogeology, Pumping, Water yield, Chemical analysis, Hydrologic data, *Maps, Water levels, Groundwater recharge.
Identifiers: *Sparta aquifer system(Miss).

This 3-sheet atlas on the Sparta aquifer system in Mississippi is the third report in the series. Information on the aquifers was obtained in the cooperative programs of the U. S. Geological Survey with the Mississippi Board of Water Commissioners and other State and Federal agencies. The Sparta Sand, a formation of the Claiborne Group of Eocene age, is a principal source of water supplies in Mississippi. This formation, which usually consists of two or more sand beds separated by clay, is available for water-supply development in more than 40 percent of Mississippi, a larger area than any other aquifer system. In 1975, about 50 mgd were pumped from wells in the Sparta, divided about equally between public supply and self-supplied industry. The public supplies and other major groundwater uses are described, and the distribution of withdrawals, by county, is shown. Water from Sparta wells generally is of good quality but high concentration of iron in the eastern half of the area and high flouride on the southwest margin are frequent. The water is a sodium bicarbonate type and generally has hardness less than 50 mg/litre--less than 10 mg/litre in the southwestern half of the area. (Woodard-USGS)
W76-11067

MAPS SHOWING GROUND-WATER CONDITIONS IN THE LOWER HASSAYAMPA AREA, MARICOPA COUNTY, ARIZONA--1975,
Geological Survey, Tucson, Ariz.
R. S. Stulik, and R. L. Laney.
Water-Resources Investigations 76-35 (open-file report), April 1976. 3 sheets, 3 ref.

Descriptors: *Groundwater resources, *Water yield, Water quality, *Aquifer characteristics, *Hydrologic data, *Maps, Water levels, Pumping, Water level fluctuations, Groundwater recharge, Water wells, Water supply, Irrigation, Chemical analysis, Specific conductivity, Dissolved solids, Fluoride.
Identifiers: *Maricopa County(Ariz), *Lower Hassayampa area(Ariz).

This 3-sheet map report shows groundwater conditions in the lower Hassayampa area, Maricopa County, Ariz. The sedimentary deposits form the main water-bearing unit and consist mainly of weakly consolidated gravel, sand, silt, clay; locally, the deposits are capped by as much as 50 feet of caliche-cemented gravel. The unit range in thickness from a few tens of feet near the mountains to as much as 1,200 feet in the central part of the area. The unit may yield from several hundred to a few thousand gallons per minute of water to wells. The long-term withdrawal of groundwater has resulted in a general decline in water levels in most of the lower Hassayampa area; however, in the southern part of the area a few water-level rises have occurred. Water-level changes in measured wells for 1956-75 ranged from a decline of about 84 feet to a rise of about 2 feet. The water level declined nearly 114 feet in one well for 1953-75. The dissolved-solids concentration ranges from less than 500 to more than 3,000 mg/litre. In the study area the annual average maximum daily air temperature is about 87 deg F, and an optimum concentration of flouride in drinking water is 0.7 mg/litre. The presence of concentrations greater than 1.4 mg/litre is grounds for rejection of the water for public supply. (Woodard-USGS)
W76-11068

WATER-QUALITY INVESTIGATION, EEL RIVER, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W76-11069

BOG STRATIGRAPHY, RADIOCARBON DATES, AND PINEDALE TO HOLOCENE GLACIAL HISTORY IN THE FRONT RANGE, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2C.
W76-11071

GREATER PITTSBURGH REGIONAL STUDIES, REPORTS AND MAPS, APRIL 1976.
Geological Survey, Reston, Va.
Geological Survey catalog, 1976. 14 p.

Descriptors: *Bibliographies, *Publications, *Hydrologic data, *Land use, *Pennsylvania, Environmental effects, Flood plains, Coal mine wastes, Erosion, Water resources, Streams, Runoff, Water quality, Data collections, Groundwater, Topography, Maps, Natural resources, Appalachian Mountain Region, Regional analysis.
Identifiers: *Pittsburgh(Penn).

Reports and maps concerning hydrology, geology, and land use related to environmental effects, are products of a cooperative program of Greater Pittsburgh Regional Studies by the U.S. Geological Survey, the Pennsylvania Bureau of Topographic & Geologic Survey, the Appalachian Regional Commission, and the Southwestern Pennsylvania Regional Planning Commission, that began in January 1971 and will cease operations in the region in June, 1976. This catalog was prepared in April 1976, at which time a number of reports and maps remained to be completed for distribution. Some of these are included, labelled 'in press'. Others were not sufficiently advanced for inclusion. (Woodard-USGS)
W76-11072

GROUND-WATER LEVELS IN NEW MEXICO, 1974,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 2F.
W76-11073

WATER-QUALITY DATA FOR CANALS IN EASTERN BROWARD COUNTY, FLORIDA, 1969-1974,
Geological Survey, Tallahassee, Fla.
B. G. Waller, W. L. Miller, and T. R. Beaven.
Open-file report FL-75009, 1976. 156 p, 2 fig, 8 tab.

Descriptors: *Water quality, *Chemical analysis, *Canals, *Florida, Environmental effects, Urban runoff, Sediments, Agricultural runoff, Estuaries, Saline water intrusion, Water analysis, Monitoring, Basic data collections.
Identifiers: Eastern Broward County(Fla).

Water-analysis data obtained from 1964-74 are presented for the Broward County water-quality-monitoring network which includes 27 stations located along 8 primary canals. The stations include discharge points from the water conservation areas, areas draining agricultural land, urban and residential drainage, and estuarine waters.

Surface-water samples were collected in the center of the canals, 1 to 2 ft below the surface. Bottom sediment samples also were collected. Broward County, on the southeast coast of Florida, contains many rapidly expanding urban areas, most of which are in the eastern part. Because most of the canals in the county are in these urban areas, the canals have become convenient receptacles for storm-water runoff and sewage effluent. The degradation of the water quality in these canals greatly affects their usefulness to the community. Contaminants entering these waters could affect their trophic state and prevent optimal use. (Woodard-USGS)
W76-11081

FLOOD FREQUENCY OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W76-11083

8. ENGINEERING WORKS

8A. Structures

SEABED SCOUR BY CURRENTS NEAR PLATFORMS,
Trondheim Univ. (Norway). Vassdrags-og Havnelaboratoriet.
For primary bibliographic entry see Field 8B.
W76-11087

8B. Hydraulics

FLUID-MECHANICS ASPECTS IN THE DESIGN OF SEWAGE OUTFALLS INTO THE SEA (STROEMUNGSMECHANISCHE ENTWURFSASPEKTE FUER ABWASSEREINLEITUNGEN INS MEER),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 5E.
W76-10678

UNDERLAKE SEWER SPURS RESORT DEVELOPMENT,
Burns and McDonnell, Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W76-10685

HYDRAULIC JUMP IN CIRCULAR SEWERS,
Greater Chicago Metropolitan Sanitary District, Ill. Sewer Design Section.
For primary bibliographic entry see Field 5D.
W76-10686

THE RELATIONSHIP OF SLOPE AND STREAM CHANNEL FORM IN THE RIVER DART, DEVON,
Exeter Univ. (England), Dept. of Geography.
For primary bibliographic entry see Field 2E.
W76-10698

OBLIQUE IMPINGEMENT OF CIRCULAR TURBULENT JETS,
Alberta Research, Edmonton. Div. of Highway and River Engineering.
S. Beltaos.
Journal of Hydraulic Research, Vol. 14, No. 1, p 17-36, 1976. 20 fig, 3 tab, 30 ref.

Descriptors: *Jets, *Boundary layers, *Reynolds number, Laboratory tests, Hydraulics, Fluid mechanics, Flow, Shear stress, Equations, Walls, Turbulence.
Identifiers: *Circular turbulent jets, Wall pressures, Impingement angle, Skin friction, Nozzle Reynolds number.

The oblique impingement of circular turbulent jets on smooth walls has been studied both experimentally and analytically. This type of flow represents a considerable degree of geometrical generality as the flow is three-dimensional in its main portion. An inductive, semi-empirical method has been developed to predict wall pressures in the impingement region. Wall shear stress in the same region has been measured on the symmetry plane and an analytical method has been presented for its prediction. For prediction of flow properties in the wall jet region, a theory has been developed which is based on boundary-layer approximations of the Reynolds equations of motion and upon the similarity ofradial velocity profiles. It was shown that the flow is quasi-axisymmetric, i.e., flow takes place along radial lines with shear stresses between radial planes being very small. The thickness of the wall jet grows linearly on each radial at a universal slope. The local skin friction factor remains constant along radials and is independent of any other parameter of the problem except Nozzle Reynolds number. Further, it is shown that dimensionless maximum velocity is proportional to dimensionless radial distance, the proportionality factor being a function of angle of impingement and angle coordinate in cylindrical system. This function was derived semi-empirically and was shown to be a reasonable description of the experiments. (Lee - ISWS)
W76-10709

FLOW RESISTANCE IN BROAD SHALLOW GRASSED CHANNELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2E.
W76-10710

TRANSPORTATION OF SOLIDS BY WATER IN PIPELINES,
Mississippi State Univ., Mississippi State. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter, and J. B. Allen.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-255 766, $3.50 in paper copy, $3.00 in microfiche OWRT A-097-MISS(1). Mississippi Water Resources Research Institute, Mississippi State, Completion Report, July 1976. 20 p, 7 fig, 2 tab, 37 ref.

Descriptors: *Pipelines, Transportation, *Slurries, Reviews, Laboratory tests, Pipes, Particle size, Hydraulics.
Identifiers: *Solids transport(Pipes), Literature reviews.

The purpose was to review the literature and to prepare a statement on current knowledge of the transport of solids by water in pipelines, and also to make a qualitative laboratory study of the behavior of solids in astream of water within a recirculating pipeline system. The initial phase of the study was a review of current literature. In the laboratory phase, all observations were made in a horizontal test section of 4 in. diameterclear acrylic pipe. Wooden spheres and cubes with a volume of 0.212 in. 3 were observed photographically and visually. Observations were also made of polyethylene pellets approximately 0.13 in. diameter and 0.20 in. long. Average water velocity ranged from 2.7 to 10.9 fps. The report includes summary statements regarding the interaction of the carrier fluid and the particles conveyed by the fluid. The findings of the laboratory study are compatible with conclusions derived from the literature review.
W76-10806

EXPERIMENTAL AND THEORETICAL INVESTIGATIONS IN AN OSCILLATORY TURBULENT BOUNDARY LAYER,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
I. G. Jonsson, and N. A. Carlsen.
Journal of Hydraulic Research, Vol. 14, No. 1, p 45-60, 1976. 13 fig, 5 tab, 9 ref.

Descriptors: *Boundary layers, *Turbulent boundary layers, Hydraulics, Coasts, Fluid mechanics, Shear stress, Laboratory tests, Hydraulic models, Beds, Oceans, Waves(Water).
Identifiers: *Oscillatory flow, *Wave friction factor, Mean specific energy loss, Wave boundary layer thickness.

The oscillatory flow near the sea bed under a wave motion is always rough turbulent in a coastal zone. This type of an oscillatory boundary layer (wave boundary layer) was therefore chosen as a subject for detailed velocity measurements, from which characteristics such as wave friction factor, mean specific energy loss, and boundary layer thickness were determined. The wave friction factor was defined from the maximum bed shear stress. The mean specific energy loss was determined by free stream velocity and wave friction factor. The wave boundary layer thickness was defined by Nikuradse roughness parameter and free stream particle amplitude. (Lee - ISWS)
W76-10916

ON ROLLING-GRAIN RIPPLES,
Cambridge Univ. (England). Dept. of Engineering.
For primary bibliographic entry see Field 2J.
W76-10917

SEEPAGE FLOW THROUGH HOMOGENEOUS SOIL INTO A ROW OF DRAIN PIPES,
Waikato Univ., Hamilton (New Zealand). Dept. f Mathematics.
For primary bibliographic entry see Field 4A.
W76-10919

LONGITUDINAL DISPERSION FOR FLOW OVER ROUGH BEDS,
New Brunswick University, Fredericton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-10921

CHANNEL WIDTH AND THE RIFFLE-POOL SEQUENCE,
Lanchester Polytechnic, Coventry(England).
For primary bibliographic entry see Field 2E.
W76-10924

APPLICATION OF FINITE ELEMENT METHOD TO OPEN CHANNEL FLOW,
Agricultural Univ., Wageningen (Netherlands). Dept. of Hydraulics and Catchment Hydrology.
D. H. Keuning.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, Proceedings Paper 12053, p 459-468, April 1976. 5 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Finite element analysis, *Open channel flow, *Tidal streams, *Marshes, *Hydraulics, Continuity equation, Energy equation, Analytical techniques, Numerical analysis, Channels, Unsteady flow, Flow.
Identifiers: *Galerkin's method, Sectional linearization, Periodic flow.

Finite element method in combination with Galerkin's principle was applied to the nonstationary and nonlinear equations for one-dimensional flow in open channels. A straight horizontal channel with a uniform trapezoidal cross section was considered. It connected a constant water level marsh with a river affected by tidal flow. Under these conditions, the channel flow became a periodic function of time. The discharge and the water depth were chosen as dependent variables. Numerical computations were performed for various sets of parameters reflecting the operating conditions. When the lock at the confluence of the channel and the river was closed, a standing wave was generated and the water flowed back to the marsh. The principle of sectional linearization was in-

troduced to avoid extensive calculations. (Singh-ISWS)
W76-10939

DESIGN OF ALTERNATING DIFFUSER PIPES,
Skopje Univ. (Yugoslavia).
A. Nospal, and J-C. Tatinclaux.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY4, p 553-558, April 1976. 4 fig, 5 ref.

Descriptors: *Thermal pollution, *Water temperature, *Laboratory tests, *Effluents, *Flow characteristics, Powerplants, Cooling water, Heat balance, Hydraulics.
Identifiers: *Multiport diffuser, Diffuser load.

Experiments were conducted in a glass-walled flume for investigating a two-dimensional model of a multiport diffuser with alternating horizontal parts. Such a diffuser pipe can often be advantageously used when large amounts of effluents are to be discharged into relatively shallow receiving bodies of water. When condenser cooling water of a power plant is discharged into receiving waters, the increase in water temperature is limited by state and federal standards. The experimental results were used to establish general relationship between the temperature rise, the volume flux ratio, and the diffuser load. A procedure was outlined for an initial design of an alternating diffuser when maximum permissible temperature rise on the water surface, temperature difference between effluent and ambient temperature, and the value of the diffuser load are specified. (Singh-ISWS)
W76-10952

SHORELINE RETAINING WALL,
T. H. Shillingford.
U. S. Patent No. 3,952,520, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1582, April 27, 1976.

Descriptors: *Patents, *Engineering structures, *kall, *Retaining walls, *Coastal structures, Erosion control, Shore protection, Sands, Waves(Water), Beaches, Coasts.

A retaining wall for use in stabilizing shoreline erosion is comprised of a footing and an upright wall portion. The front face of the wall has a number of recesses spaced apart from each other to form a pattern extending the length and height of the wall. Each recess is horizontally oriented and is uniform in cross-section throughout its depth. The lateral dimension of the recess is not less than 18 inches in any direction, and the depth is not greater than the width. The wall is located along the shoreline at a distance from the waterline reached by an average wave. The footing is rested on firm ground. It is preferable to bury the wall initially to cover at least the bottom row of recesses as a safety factor to prevent the footing from being undercut. When the wall is in place, waves travelling up the beach and carrying entrained sand will impinge on the wall. The water will enter the recesses and because they are shallow and blind, the kinetic energy of the water will be dissipated and at the same time air trapped in the recesses will be entrained in the water. As the dead water falls back from the recesses it will drop in front of the wall carrying the entrained air and sand to form a sieve-like bed of sand through which the water will percolate. In this manner a beach is built against the wall. (Sinha-OEIS)
W76-10953

PORTABLE FLOATING WAVE TRIPPER,
J. M. Potter.
U. S. Patent No. 3,952,521, 5 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 945, No 4, p 1582, April 27, 1976.

Descriptors: *Patents, *Engineering structures, *Breakwaters, *Coastal structures, Shore protection, Ocean waves, Waves(Water), Pontoons, Floats.

A floating breakwater or wave tripper supported by pontoons or floats is disclosed. The breakwater is useable for moderating waves and for creating a generally calm surface on the water behind the breakwater. Since the device is carried by floats of pontoons, it is portable and may be moved and positioned as desired. The pontoons or floats which support the breakwater are so shaped that the device cuts through the waves striking it instead of floating over them, and is therefore more effective in reducing the height of incident waves than are prior devices which float on the surface of the wave. Suitable anchors are provided to secure the device in a desired location and a number of wavebreakers may be joined together to form a portable breakwater of generally any desired length. (Sinha-OEIS)
W76-10954

COMBINED DRAIN AND FLOOD GATE,
For primary bibliographic entry see Field 3F.
W76-10968

OIL PORTS ON THE CONTINENTAL SHELF,
Exxon Research and Engineering Co., Florham Park, N. J.
For primary bibliographic entry see Field 5G.
W76-10984

STEADY LAMINAR FLOW IN A STATIONARY TANK WITH A SPINNING BOTTOM,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
C. V. Alonso.
Journal of Applied Mechanics, Transactions of the ASME, Vol. 42, No. 4, p. 771-776, 1975, 10 fig., 10 ref. ASME Paper No. 75-APM-U.

Descriptors: *Rotating flow, *Boundary layer, *Laminar flow, *Mathematical models, *Numerical analysis, *Experimental models, Steady flow, Circulation, Hydrodynamics.
Identifiers: *Navier-Stokes equations, *Finite differences, Newtonian fluids.

The steady incompressible viscous flow induced in a cylindrical tank by the rotation of its bottom was studied both theoretically and experimentally. The complete Navier-Stokes equations are expressed in terms of the tangential velocity, vorticity, and meridional stream function. The transformed equations are solved numerically using and alternating-direction implicit scheme and a nonuniform grid. The general validity of the numerical solution was demonstrated by the agreement between the computed and experimental results. (USDA-ARS)
W76-11062

FLOODFLOW CHARACTERISTICS AT PROPOSED BRIDGE SITE ON MOHAWK RIVER IN TOWNS OF FRANKFORT AND SCHUYLER, HERKIMER COUNTY, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 4A.
W76-11079

APPLICATION OF SIMPLE DAM BREAK ROUTING MODEL,
Geological Survey, Reston, Va.
R. S. McQuivey, and T. N. Keefer.
In: Fundamental Tools to be Used in Environmental Problems; Proceedings of 16th Congress of International Association for Hydraulic Research, Sao Paulo, Brazil, July 27-August 1, 1975, Volume 2, p 315-324, 1975. 4 fig, 1 tab, 2 ref.

Descriptors: *Dam' failure, *Flood routing, *Model studies, *Flood forecasting, *Computer models, Mathematical models, Hydrographs, Regression analysis, Peak discharge, Equations, Dam design.
Identifiers: *Multiple-linearization technique.

A multiple-linearization flow-routing model is used to route a discharge hydrograph resulting from the rupture of a mine-waste pond to downstream locations. The peak flow results are compared to flow measurements made by slope-area indirect measurement techniques. Estimates of peak stage are compared to stages obtained from high-water marks. The comparisons point out the possible limitations of estimating unsteady flow by steady flow techniques and the difficulty of applying a simple model to a complex flow problem. (Woodard-USGS)
W76-11084

SIMPLIFIED ROUTING OF DAM BREAK WAVES,
Geological Survey, Bay St. Louis, Miss., and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-11085

SEABED SCOUR BY CURRENTS NEAR PLATFORMS,
Trondheim Univ. (Norway). Vassdrags-og Havnelaboratoriet.
T. Carstens.
Marine Science Communications, Vol 2, No 1, p 69-93, 1976. 18 fig, 8 ref.

Descriptors: *Continental Shelf, *Offshore platforms, *Drilling, Engineering structures, Hydraulic structures, Resources development, Environmental effects, Scour.
Identifiers: *Outer Continental Shelf, *Gravity platforms(Offshore), *Scour protection, North Sea.

The gravity platforms in the North Sea, sitting directly on granular seabeds, may be undercut by scour and need scour protection. Conventional methods of protection are developed for structures 1 or 2 orders of magnitude smaller and seem unnecessarily conservative when scaled to these larger sizes. The reason is that some of the flow details that exert extra stresses on the bed, are not preserved during scale-up. Some new ideas for scour protection are discussed. These are all built into the structure so as to reduce expensive offshore operations as much as possible. A breakthrough in protection techniques is anticipated before long as a result of the present effort in several countries to come up with satisfactory designs. The existing prediction formulas for scour depth at bridge piers are likely to be misleading when applied to large gravity platforms. With increasing diameter the scour at the cylinder wall becomes less extensive both in relative area and relative depth. Scour will nevertheless occur, and ideas for built-in scour protection are discussed. These ideas have been tested to some extent in small scale hydraulic models, with results ranging from full protection to reduced scour. Full scale performance data are still missing or at best uncertain. Several promising methods are at present in the development phase and need large scale testing before they can be finally evaluated. (Sinha-OEIS)
W76-11087

FINAL ENVIRONMENTAL STATEMENT, CONSTRUCTION OF ARTIFICIAL REEFS IN THE ATLANTIC OCEAN OFF CAPE HENRY, VIRGINIA.
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
U.S. Commerce Department, NOAA, October 2, 1972. 11 p, 5 ref.

Descriptors: *Continental Shelf, Resources development, *Environmental effects, Habitats, *Artificial substrates, Water resources, *Virginia, Reefs, Ecosystems, Fish, Shellfish, *Atlantic Ocean.
Identifiers: *Outer Continental Shelf, *Artificial reefs, *Environmental impact, Cape Henry(Va).

Two artificial reefs of approximately 80 and 4000 acres will be constructed in the Atlantic Ocean approximately 15 and 30 miles east of Cape Henry, Virginia. The reefs will be constructed of 166 surplus Navy vessels (36 ft. - 96 ft.). This project will create habitat attractive to sport fishes in an area where such habitat does not occur naturally. Underwater observations will be made by the National Marine Fisheries Service (NMFS) to determine changes in the biota on and surrounding the reefs. The physical alteration of the ocean that will occur is expected to create new habitats for many types and substantial numbers of marine organisms including game fishes. The proposed reefs will occupy bottoms suitable for the operation of conventional commercial trawling gear. Neither site is presently fished commercially because of low productivity and the presence of ship wrecks. Benthic fauna will be covered by the vessels, however, this will not significantly affect population sizes of the species involved. No significant adverse environmental effects are anticipated as a result of this project. (Sinha-OEIS)
W76-11094

8C. Hydraulic Machinery

HOW TO USE AND SELECT A SCREW PUMP,
Lakeside Equipment Corp. Bartlett, Ill.
W. L. Berk.
Water and Sewage Works, Reference number, p R-22, R-24-R-27, April 30, 1976. 4 fig, 1 tab.

Descriptors: *Pumps, *Pumping, *Waste treatment, *Sewage treatment, *Hydraulic equipment, Evaluation, Performance, Efficiencies, Flow, Equipment, Irrigation systems, Treatment facilities, Surface drainage, Hydraulic engineering.

The use of screw pumps for moving large quantities of liquid at a relatively low lift is discussed. Screw pumps are currently being used in the following applications: activated sludge return, raw sewage lift stations, raw and effluent sewage plant lift stations, industrial product and waste handling, storm water pumping, irrigation, land drainage, and the delivery of a constant flow to treatment works with equalization basins. Screw pumps require less total dynamic head, operate at higher efficiency, and require less energy for a given application when compared with centrifugal pumps. Selection criteria and design considerations for screw pump applications are outlined. The mathematics of a hypothetical pump selection are developed in terms of total lift and pump speed, drive selection, screw pump loadings, and deflection. A tabulation of screw pump lift and capacity data is also presented. (Kreager-FIRL)
W76-10681

FIVE PUMPS SALVAGE A QUEBEC SEWER JOB,
N. Hancock.
Engineering and Contract Record, Vol. 89, No. 5, p 34, May, 1976. 1 fig.

Descriptors: *Separated sewers, *Drains, *Pipes, *Storm drains, *Pumps, *Floods, *Melt water, Rain water, Storm runoff, Construction.

Five large pumps were used to bail out when a sudden January mild spell caused serious flooding of a storm sewer being installed in Chateauguay, Quebec. The route followed an S-curve from the town's principal highway where a 1.5 m storm drain and a 67.5 cm sanitary drain are buried. During construction, part of the 1.5 m drain was temporarily removed and the runoff transferred by two electric pumps into the 3 m diameter pipe being installed. These pumps were unable to contain the flooding resulting from the combination of the sudden thaw and heavy rain. Although three more pumps were added, almost 2 days were required to pump at least 8 m of water out of the trench. The crushed stone base for the pipe had to be re-laid after the water was removed. The depth of the trench was 9 m, and its width was 14 m at the top, narrowing to 5 m at the lowest point. The excavation was done in two stages, after which the bottom of the trench was levelled and the pipe installed. A bulldozer was used to scrape earth from underneath telephone cable crossings. These lines slowed progress, although they were clearly marked on the drawings. A crane was used to lower the pipe into the trench. (Snyder-FIRL)
W76-10689

MATERIALS FAILURE IDENTIFICATION MANUAL FOR SEA WATER DESALINATION PLANTS.
Aqua-Chem, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 3A.
W76-10880

8F. Concrete

VOLUME AND STRENGTH OF A DOLOS,
Brown and Root, Inc., Houston, Tex.
H. C. Desai.
Journal of the Waterways, Harbors, and Coastal Engineering Division, American Society of Civil Engineers. Vol. 102, No. WW1, p 79-88, February 1976. 2 fig, 5 tab, 12 equ, 10 ref.

Descriptors: *Breakwaters, *Concrete mixes, *Harbors, *Facilities, Mechanical engineering, Protection, Stress, Strain, Volume, Strength, Size.
Identifiers: *Concrete(Reinforced), *Dolos.

A precise formula is presented for computing the block volume of dolos and a concrete armor stone for protection of breakwaters and marine structures, with particular emphasis for a heavier dolos. A dolos is first treated as a solid concrete body falling by rotating under its own weight. An energy approach is followed and total external energy due to fall is compared with the total internal ultimate energy capacity of the dolos as a solid concrete body. A dolos is then treated as a solid concrete element of defined shape in a particular position and then hit by another dolos. Theories of failure of engineering mechanics are applied to determine maximum principal stresses and principal strains. These are then compared with concrete rupture stresses and strains. An attempt is made to indicate the usefulness or otherwise of steel fibers as reinforcing admixtures. Three different sizes of a dolos are compared and two mixes of concrete are considered. (Bell-Cornell)
W76-10523

8G. Materials

FINAL REPORT, MATERIAL EVALUATION AND DEVELOPMENT PROGRAM, OSW SAN DIEGO TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W76-10552

FIBER-GLASS-REINFORCED POLYESTERS AND FURAN RESINS FOR WATER- AND WASTE-TREATMENT SYSTEMS,
Ashland Chemical Co., Columbus, Ohio. Resins and Plastics Div.
W. A. Szymanski, and R. C. Talbot.
American Water Works Association Journal, Vol. 68, No. 5, p 228-231, May, 1976. 2 fig, 3 tab, 6 ref.

Descriptors: *Linings, *Resins, *Plastics, *Polymers, *Materials, *Waste water treatment, *Corrosion control, Physical properties, Treatment facilities, Equipment, Waste treatment, Bacteria, Algae, Fungi, Mildews.
Identifiers: Fiberglass, Furan resins.

Properties of fiberglass-reinforced polyester and furan resins are reviewed in relation to their use in water- and waste-treatment applications. These materials show good chemical resistance was well as resistance to bacteria, algae, fungi, and mildew. The strength characteristics of furan laminates compare favorably to those of ordinary carbon steel and aluminum. The coefficient of thermal expansion of fiberglass-reinforced plastics is about twice that of steel or concrete and about the same as that of aluminum. A large water treatment plant capable of reclaiming chrome and process water at a rate of 6000 gallons/min is currently using fiberglass-reinforced polyester and furna linings for the inlet flume and trough, the equalization tank, two treatment tanks, two reaction tanks, a drain sump, an acid sump, steel storm retention tanks, clarifiers, and thickeners. (Kreager-FIRL)
W76-10682

COMPARING INFLOW AND INFILTRATION,
Pool (Charles) and Associates, Inc., Ketchikan, Alaska.
For primary bibliographic entry see Field 5D.
W76-10683

CLEVELAND MIXES METHODS IN SEWER CONSTRUCTION.
For primary bibliographic entry see Field 5D.
W76-10684

TOWN MAINTAINS SEWERS DESPITE 'SUGAR SAND',
Bossier City Utilities Dept., La.
For primary bibliographic entry see Field 5D.
W76-10687

SEWERS - RELINING VS REPLACEMENT,
Grand Rapids City Engineer Office, Mich.
R. J. Spry.
Water and Sewage Works, Reference number, p R-66, April 30, 1976.

Descriptors: *Sewers, *Linings, *Polymers, *Maintenance, Plastic pipes, *Maintenance costs, Materials, Sewage treatment, Conduits, Engineering structures, Structures.
Identifiers: Polyethylene, Polyvinyl chloride.

Experience with two sewer relining projects in Grand Rapids, Michigan is reported. One project involved relining 305 ft of a 10-inch sewer with DuPont Aldyl Series D Polyethylene which was installed in 18-foot lengths using a butt weld. The cost for relining was about $54.50/ft as compared with an estimated $85.20/ft which would have been required for reconstruction. The other project involved the relining of 47 ft of an 8-inch sewer with polyvinyl chloride pipe. Relining rather than replacement of this section resulted in a cost savings of more than $3400. The use of the above materials for making house connections did not prove to be successful. Pipe manufacturers are continuing efforts to improve the technique for this purpose. (Kreager-FIRL)
W76-10690

NEW BOILER WATER CHEMICAL TREATMENT REDUCES CORROSION AND SCALE BUILDUP.
For primary bibliographic entry see Field 3E.
W76-10859

MATERIALS FAILURE IDENTIFICATION MANUAL FOR SEA WATER DESALINATION PLANTS.
Aqua-Chem, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 3A.
W76-10880

PROCESS OF WATER TREATMENT,
Water Technology Service, Inc., Cleveland, Ohio. (Assignee).
For primary bibliographic entry see Field 5F.
W76-10971

8I. Fisheries Engineering

THE USE OF FLOWING BIOLOGICAL SYSTEMS IN AQUACULTURE, SEWAGE TREATMENT, POLLUTION ASSAY AND FOODCHAIN STUDIES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10986

HEAT EXCHANGERS FOR USE IN THE CULTURING OF MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10990

SOCIAL, POLITICAL, REGULATORY AND MARKETING PROBLEMS OF MARINE WASTE-FOOD RECYCLING SYSTEMS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-10991

THE USE OF POWER PLANT WASTE HEAT IN MARINE AQUACULTURE,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5D.
W76-10992

INTEGRATED SYSTEMS OF MOLLUSK CULTURE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W76-10996

POLYSPECIES AQUACULTURE SYSTEMS: THE DETRITAL TROPHIC LEVEL,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10997

COMPARISON OF THE FOOD CHAIN DYNAMICS OF THE POLYCHAETE, NEREIS VIRENS CULTURED ON ANIMAL TISSUE AND DETRITUS,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-10998

RECYCLING GROUND WATER IN WAUSHARA COUNTY, WISCONSIN: RESOURCE MANAGEMENT FOR COLD-WATER FISH HATCHERIES,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 4B.
W76-11082

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
For primary bibliographic entry see Field 10C.
W76-10881

10C. Secondary Publication And Distribution

DIRECTORY OF DISASTER-RELATED TECHNOLOGY,
Federal Disaster Assistance Administration, Washington, D. C.
Hud Report No. 401-FDAA, 1975. Prepared for the Federal Disaster Assistance Administration by the Smithsonian Science Information Exchange, Washington, D. C. 817 p, 559 ref.

Descriptors: *Disasters, *Floods, *Safety, *Research and development, *Research priorities, *Technology, *Hazards, Governments, Safety factors, Hurricanes, Water quality, Earthquakes, Tornadoes, *Information exchange, Publications.
Identifiers: Performing organization, Major disasters, Directures.

The Directory is a compendium of studies, investigations and research efforts undertaken since 1970 related to disaster preparedness, assistance, mitigation and hazard reduction of natural disasters in the U. S. Its purpose is to improve the application of disaster related technology by Federal, State and local governments and the private sector through information exchange on the results of research studies. Information is arranged into eight sections with each of the 1,287 projects keyed to a unique reference number which provides quick access to all elements of information. The sections are: Geographic Areas, locations in which technology has application; Functional Categories, information relating to individual assistance, public assistance, disaster mitigation and hazard reduction; Technology Categories, detection, engineering, geology, seismology and transportation engineering; Disaster Types has full text summaries of ongoing and completed projects, classified by subject content. Supporting Organization has a single alphabetical listing of supporting agencies with cross reference numbers to the project in the Disaster Types Section, an address list and an alphabetical listing of supporting organizations arranged within each disaster type; Performing Organization provides reference numbers for projects and lists performing agencies within each disaster type; Investigator/Author and Project Title List complete the directory. An extensive bibliography on natural hazards is included. (Salzman-North Carolina)
W76-10502

LITERATURE REVIEW: MOVEMENT OF SPILLED OIL AT SEA,
Mathematica, Inc. Philadelphia, Pa. Regional and Environmental Studies,
For primary bibliographic entry see Field 5B.
W76-10599

DIRECTORY OF EPA, STATE AND LOCAL ENVIRONMENTAL QUALITY MONITORING AND ASSESSMENT ACTIVITIES.
Smithsonian Institution, Cambridge, Mass. Center for Short-Lived Phenomena.
For primary bibliographic entry see Field 5G.
W76-10623

A SELECTED ANNOTATED BIBLIOGRAPHY ON FISH AND WILDLIFE IMPLICATIONS OF MISSOURI BASIN WATER ALLOCATION,
Colorado Univ., Boulder, Colo. Inst. of Behavioral Science.
For primary bibliographic entry see Field 4C.
W76-10825

DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS: FEEDLOT POINT SOURCE CATEGORY,
Environmental Protection Agency, Office of Air and Water Programs. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-10829

DDT IN WATER, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5C.
W76-10877

WATER REUSE, A BIBLIOGRAPHY, VOLUME 5.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5D.
W76-10878

AGRICULTURAL RUNOFF, A BIBLIOGRAPHY, VOLUME 2.
Office of Water Research and Technology, Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-10879

SOURCES OF INFORMATION IN WATER RESOURCES, AN ANNOTATED GUIDE TO PRINTED MATERIALS,
California Univ., Berkeley. Water Resources Center Archives.
G. J. Giefer.
Water Information Center, Inc., Port Washington, N. Y., 1976, 290 p.

Descriptors: Water resources, *Documentation, *Bibliographies, *Publications, *Information exchange, United States, Research and development, Environment, Water quality, Data collections.

This guide cites and annotates over 1,100 titles found useful for reference purposes in the water resources field. The guide attempts to bring together secondary sources, a core of titles familiar to hydrologists, titles from allied fields which cover certain aspects of water, and the pertinent bibliographic aids now appearing in the literature as the environmental sciences. The emphasis has been upon the literature of the United States. While several titles treating each of the States are included, there is no attempt to include all existing reference works on specific areas and States. Textbooks are not included; few journal citations are included. The period covered is, in general, 1960 to date; earlier works are included in several subject areas where the work cited represents a long retrospective search or is otherwise in some way noteworthy. The literature has been arrange in a modified form of the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology. Within the subdivisions of these categories, reference works have been arranged by the following forms: guides and manuals; bibliographies; indeces and abstract journals; encyclopedias; dictionaries; publication lists; handbooks; directories; and data compilations. A combined author, title, subject index is provided.
W76-10881

GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02F.
W76-11066

10F. Preparation Of Reviews

GROUNDWATER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02F.
W76-11066

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